4 MARCH 1955

ONE SHILLING

ELECTRICAL TIMES

• Mazda •
• lamps •
• stay •
• brighter
• longer •

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New method installation enables alternative lighting schemes at moment's notice. Send details following inquirers :- ...ation Committee : Canteen Manager, Amalgamated ... & Gibbons Dept. Stores Ltd. : Saint ... United Sports Club : ... Council,

The British Thomson-Houston Company Ltd., Crown House, Aldwych, London W.C.2 .
(Member of the A.E.I. Group of Companies)

B T-H

4571

There can only be one winner in any field . . .

and Benjamin are in the lead when it comes to tungsten lighting. Our wide and varied range of tungsten fittings are already providing illumination that is stepping-up production in factories all over the world. *You'd* find it a profit-maker, too. Write for details or ask for our engineer to call.

Better lighting by

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Smee's 18/54

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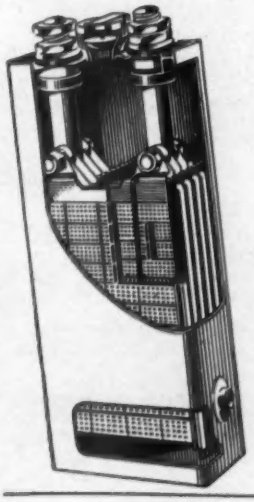
Specify NIFE batteries at the outset

If you're installing new switchgear, now is the time to call in NIFE. You'll be rewarded with years of trouble-free service from batteries that cost virtually nothing to maintain! They take up less than one-third of the space of conventional equipment, and as they can be installed adjacent to other equipment, a separate battery room is not necessary.

A NIFE BATTERY — Is made of steel and has great mechanical strength ★ Withstands the heaviest discharge ★ Recovers voltage instantaneously ★ Is free from self-discharge ★ Is unfailingly reliable.

No wonder so many electrical engineers specify Nife!



NIFE **STEEL ALKALINE BATTERIES**

repay their original cost many times over

NIFE BATTERIES · REDDITCH · WORCESTERSHIRE

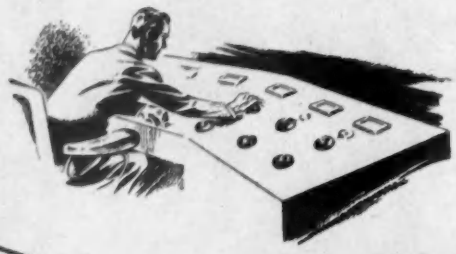
N78

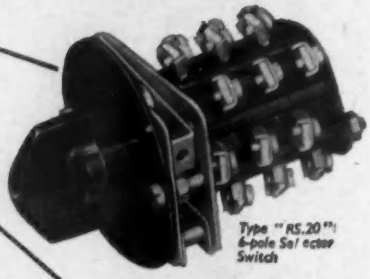
A

REMOTE CONTROL

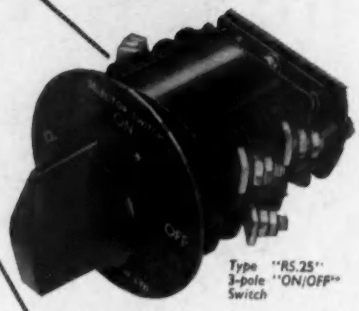
through **WELL DESIGNED, WELL MADE**

CONTROL SWITCHES

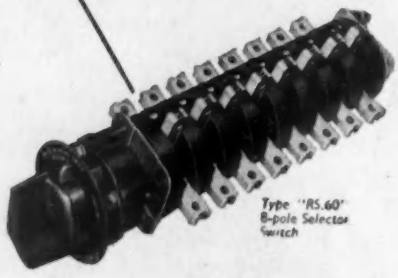




Type "RS.20" 6-pole Selector Switch



Type "RS.25" 3-pole "ON/OFF" Switch



Type "RS.60" 8-pole Selector Switch

The application of the control switch is rapidly increasing and a great variety of industrial equipment now calls for the inclusion of one or more types as essential features of its construction.

"Ferguson Pailin" have developed, for these purposes, the switches illustrated. They are compact, robust and positive in action, within ratings of 20/60 A—230 V.

Designed for back of panel mounting, their small space requirements make them particularly suitable where this factor is of importance—and that is ALMOST ALWAYS.

The ratings of the individual switches are as follows:—
RS.20—20 amp 230 volt, 10 amp 440 volt, A.C.
RS.25—25 amp 230 volt, 10 amp 440 volt, A.C. and D.C.
RS.60—60 amp 230 volt, 30 amp 440 volt, A.C. and D.C.
RC—A "spring return to neutral" 2 or 3 position switch for use as a controller for Circuit-Breakers, Governor Motors, etc.

Type "RC" Control Switch with Pistol Grip Handle.

Specify one or more of types

RS 20/25/60

or type RC

for that control job!

Catalogue SP gives detailed information Please write for a copy

Ferguson Pailin LIMITED *for Switchgear*

Member of the A.E.I. Group of Companies

Head Office & Works: **HR. OPENSHAW MANCHESTER 11,** *Telephone :* DROylsden 1301 (Pte.Branch Ex)

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CONNOLLYS' Paper Insulated Power Cables are produced to British Standards and other specifications from 660 to 11,000 volts. Special finishes can be manufactured to customers' own requirements.

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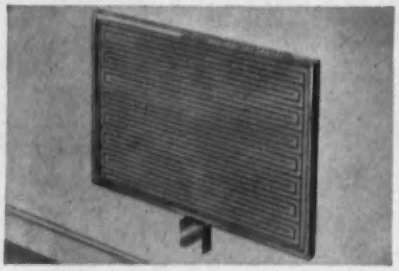

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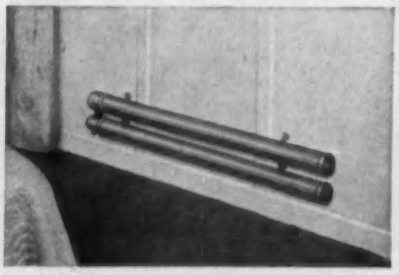
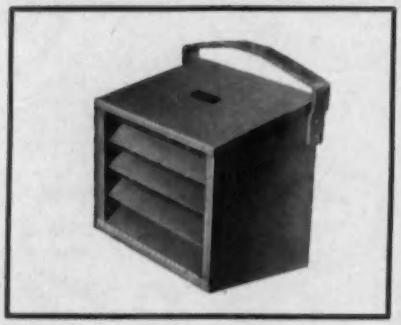


Thermotubes. Tubular heaters in lengths from 2 ft. to 12 ft. giving a great flexibility of installation. Horticultural, Waterproof and Flameproof types are also available.



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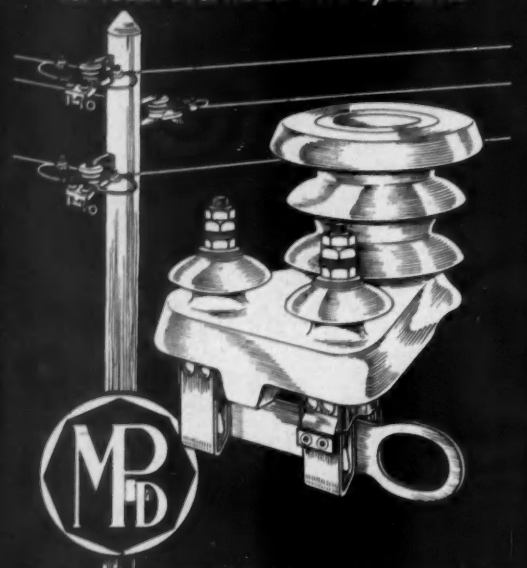
SWITCH FUSES · SCREW PLUG FUSES

for local overhead line systems



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Metering Current Transformer Type R 712

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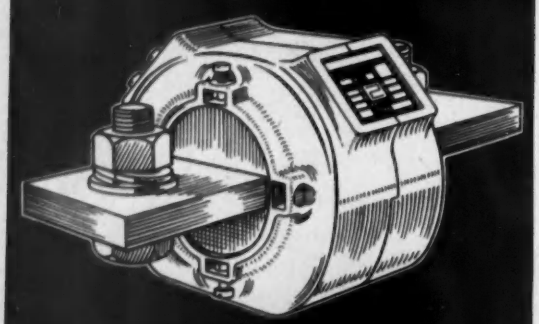

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Class 'E' Switchgear introducing 'ISOLECTOR'

'ENGLISH ELECTRIC' Class 'E' Switchgear, incorporating the 'Isolector' mechanism, is expressly designed for power station auxiliaries control.

- *Internal isolation.*
- *Handsome, dust-protecting cubicles.*
- *Excellent main and multi-core cabling facilities.*

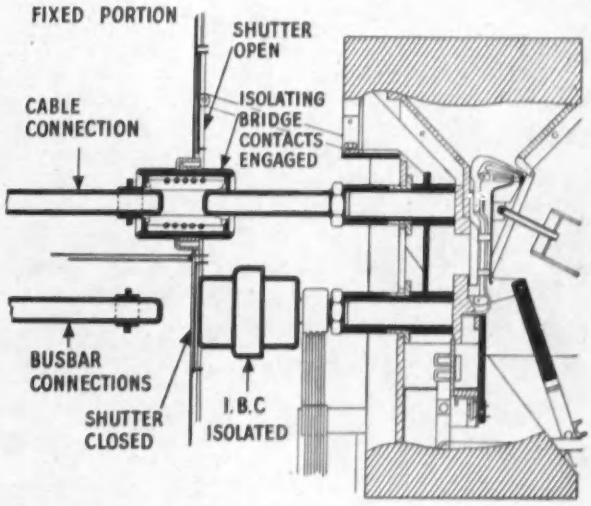
An earthing switch forms an integral part of each unit, and a mimic diagram provides unique visual circuit indication.

With this switchgear *it is not necessary to withdraw the breaker to isolate.* Isolation is quickly and simply achieved by the isolating bridge contacts. The 'Isolector' mechanism simplifies busbar selection in duplicate busbar units, which are available in the same dimensions as single busbar units.

Ratings: Breaking capacity — 150 MVA at 3.3 kV
Max. Service voltage — 3,300 volts
Max. Current rating — 2,000 amps

HOW THE 'ISOLECTOR' OPERATES

The 'Isolector' mechanism is operated through an interlock gate, by a detachable lever, which through linkage slides the isolating bridges in and out of contact with the busbar and feeder connections.



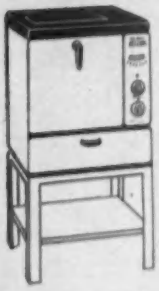
'ENGLISH ELECTRIC' switchgear

THE ENGLISH ELECTRIC COMPANY LIMITED, QUEENS HOUSE, KINGSWAY, LONDON, W.C.2
Switchgear Department, Liverpool

WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON

SGL.19C5

for small family cooking



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2 ***PRICE:*** **it costs only £13 15 0 (Stand 44/- extra).**

3 ***ADVERTISING:*** **the Baby Belling is being advertised on a massive scale. There are frequent spaces in nearly 200 national daily, provincial evening and local weekly newspapers. If your stocks are getting low, please get in touch with us right away.**

you can't beat a "Belling"

BELLING & CO. LTD • BRIDGE WORKS • ENFIELD • MIDDX • HOWARD 1212

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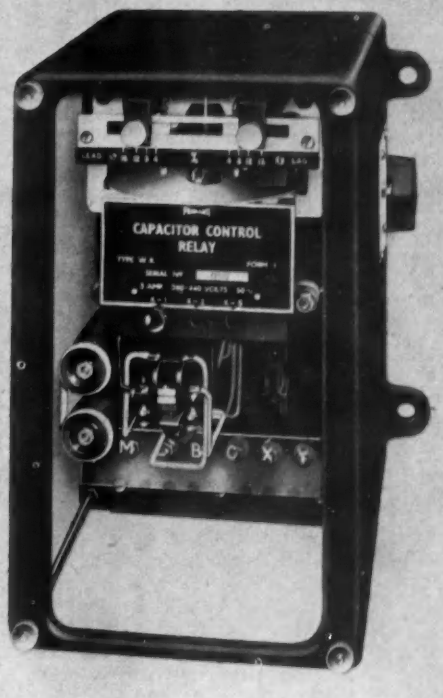
FERRANTI

CAPACITOR CONTROL RELAY

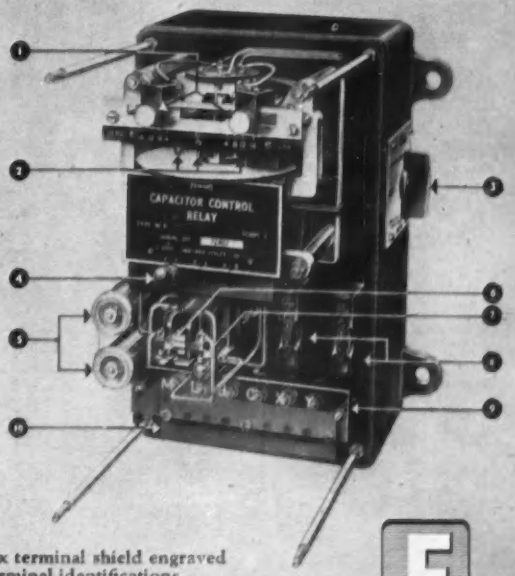
(TYPE WR)

FOR SINGLE STAGE CONTROL



This relay provides *automatic power factor correction* when used with suitable capacitors.

- Independently adjustable "lead" and "lag" settings over a wide range.
- Self-contained auxiliary element with substantial contacts to operate the heavy duty capacitor contactor.
- Selector switch to give automatic or manual control as required.



1. Independently adjustable settings for "lead" and "lag".
2. Contacts operated by movement of disc.
3. Switch for auto/manual control.
4. Settings multiplier change plug.
5. Limiting resistors in series with auxiliary relay coil.
6. Auxiliary Relay—main contacts for capacitor control.
7. Auxiliary Relay—"Hold-on" contacts.
8. Fuses.
9. Perspex terminal shield engraved with terminal identifications.
10. Dust-tight entries for wiring to terminals.

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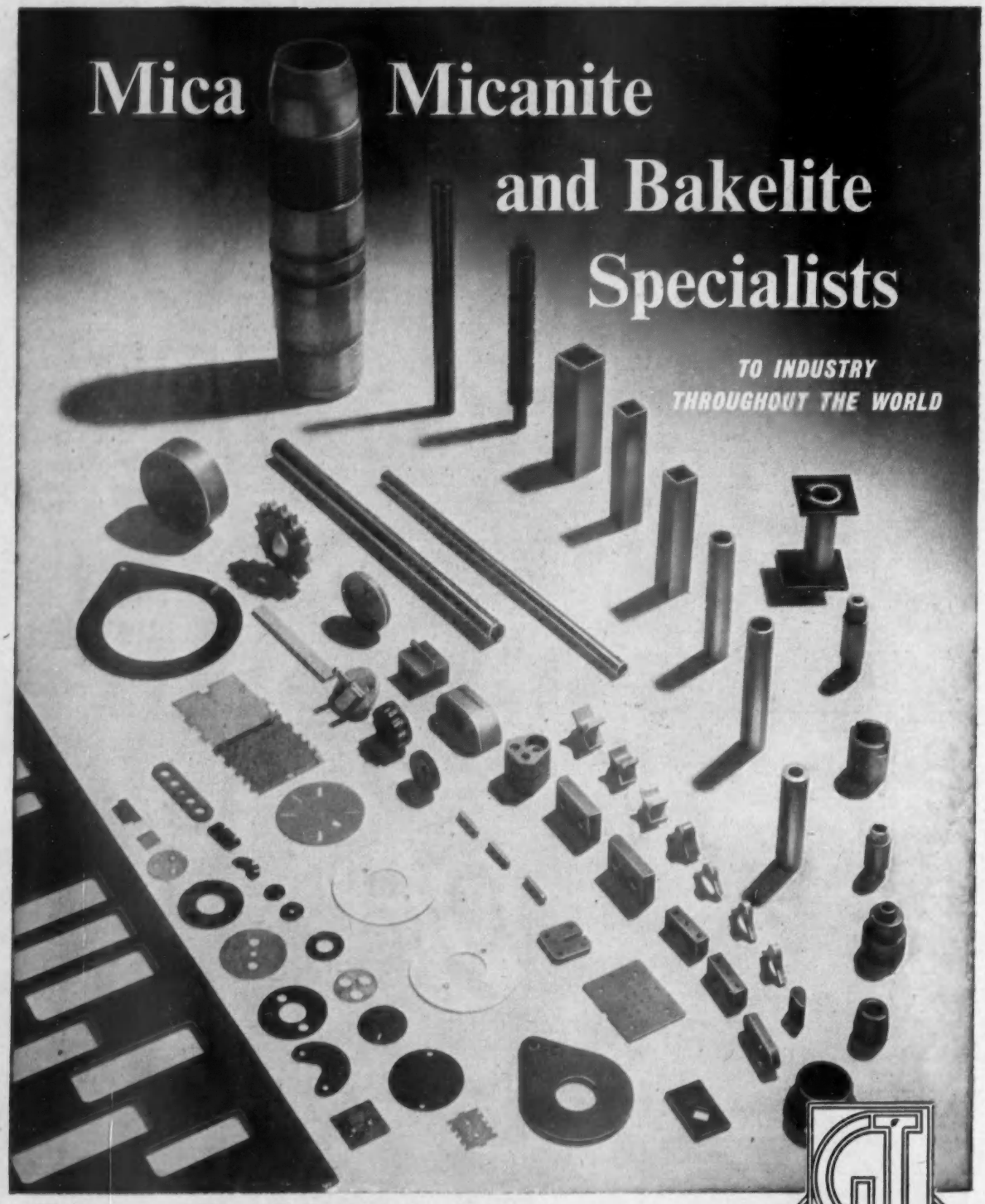

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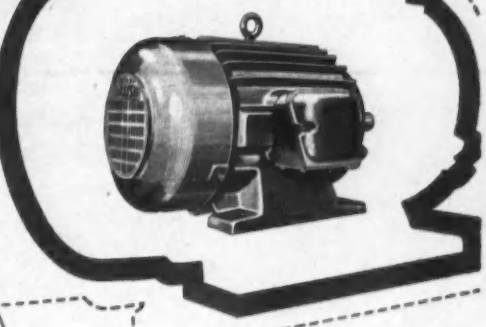
The Brush factory at Cardiff specialises in small motors – and quick service. From 1 h.p. fly weights to middle weights with 80 h.p. on the shaft, you get exactly what you want from Brush. Practically every type of small motor is immediately available. For driving fan and pumping sets, compressors, machine tools, conveyor belts, quarry equipment, paint mixers, grinding mills, textile machinery and an infinite variety of other industrial applications. Brush small motors can be supplied to conform to BSI, CSA or NEMA standards.



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BRUSH ELECTRICAL ENGINEERING CO. LTD., HOPKINSON WORKS, CARDIFF · MEMBER OF THE BRUSH GROUP

TRADE MARK

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CHAIRMAN WALTER F. HIGGS M.I.E.E.

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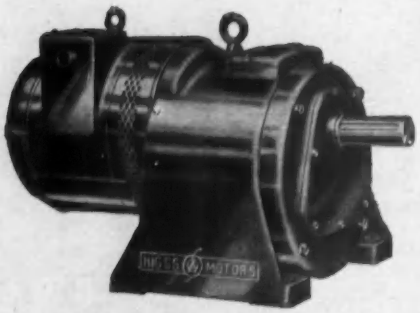

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IMMEDIATE DELIVERY OF

- **UNIVERSAL MOTORS**
  1/100 — 1/6 h.p.
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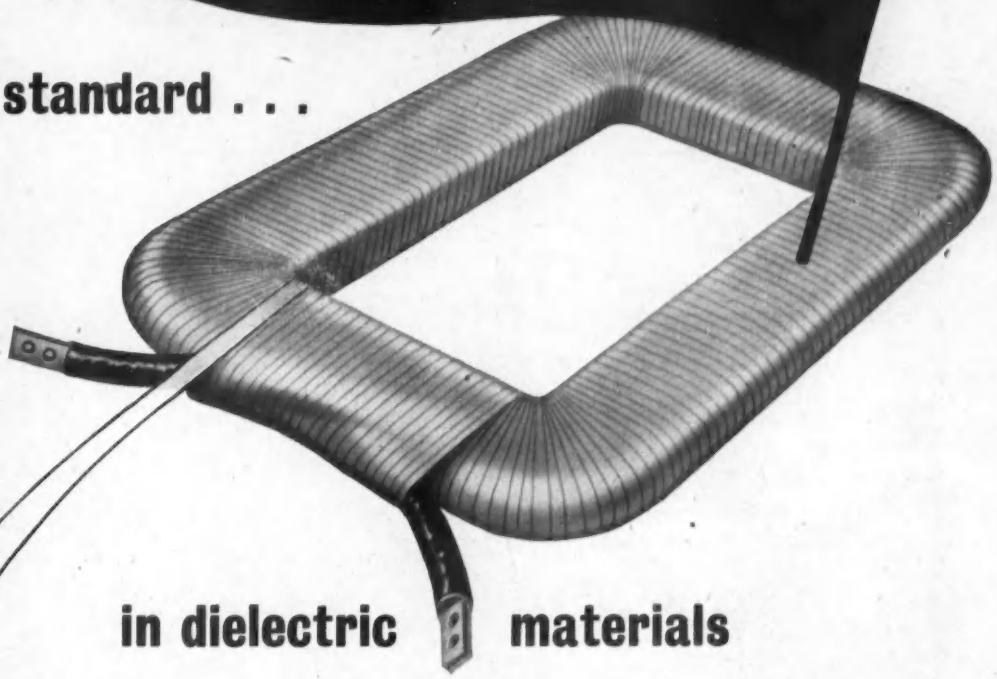

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FOR UTMOST RELIABILITY
with minimum maintenance costs

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The middle illustration shows 400 Volt Vertical Isolation Switchboard containing CIRCUIT BREAKERS ASTA tested to 25 MVA at 400 Volts to BSS. 116.

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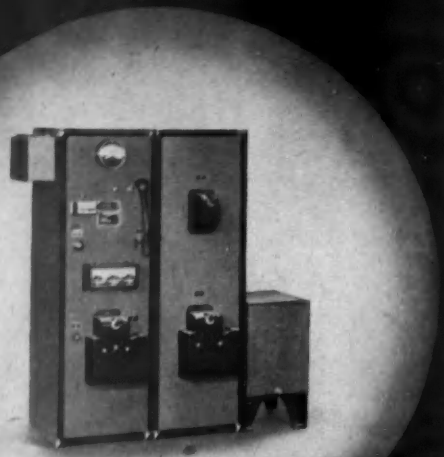
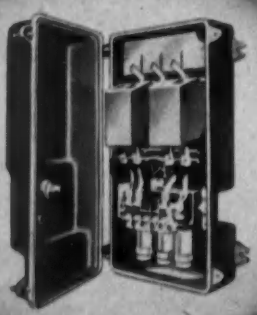
WE MANUFACTURE
L. T. SWITCHGEAR from
50/5,000 Amps
E.H.T. SWITCHGEAR up to 11kV
200 MVA rupturing capacity
MOTOR CONTROL GEAR
1/5,000 H.P.





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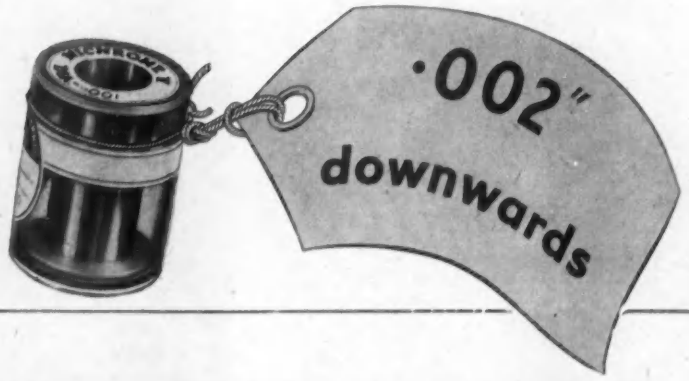
IN THE BEST-KNOWN ALLOYS

A LARGE, up-to-date plant is engaged in the production of super fine resistance wires in sizes from 0·002in. (0·05mm) downwards, annealed in bright or oxidised finish, or hard drawn. The wires are available in all our resistance alloys, and notably 80/20 nickel-chromium (" Nichrome " V), 65/15/20 nickel-chromium-iron (" Nichrome "), nickel-chromium-aluminium-iron (" Karma "), and 60/40 copper-nickel (" Advance ").

The alloy " Karma " has particular interest for designers and manufacturers of electronic equipment required to operate at such extremes of temperature as minus 65°C to plus 150°C (hence its use in guided missile controls, and in aircraft navigational and fire-control devices).

BRITISH DRIVER-HARRIS CO. LTD

MANCHESTER 15



Nickel and Nickel Alloy Specialists: Alloys for Domestic Appliances; Furnace Elements and in Furnace Construction; Thermo-couples; Radio, TV and Lamps (sleeves, anodes, grids, filaments, supports, glass-metal seals, etc.); Spark Plugs (centre and side electrodes and such as special strip for stamping out multi-point discs for aircraft plugs); Super Fine Wires; etc.

NICHROME

Exports and the Balance of Power

THE CRANES THAT LOAD THE SHIPS that carry British goods to the four corners of the earth are—electric. The equipment that moves the goods through the factories that make them is—electric. The machines that *make* the goods are usually—electric. The goods themselves may well consist of electrical equipment—for electrical exports were valued at over £216 million in 1954.

Electricity plays a very big part indeed in British exports—and the part is growing bigger every year. So what happens to all the other users of electricity? It's very good news for them. Why?

It's a matter of balance. Different jobs need electricity at different times of the day and night. These varied demands help to even out the load on the power stations. When generating plant is continuously operated the price of electricity is kept low. All users benefit, therefore, the more widely electricity is used, for more and more purposes.

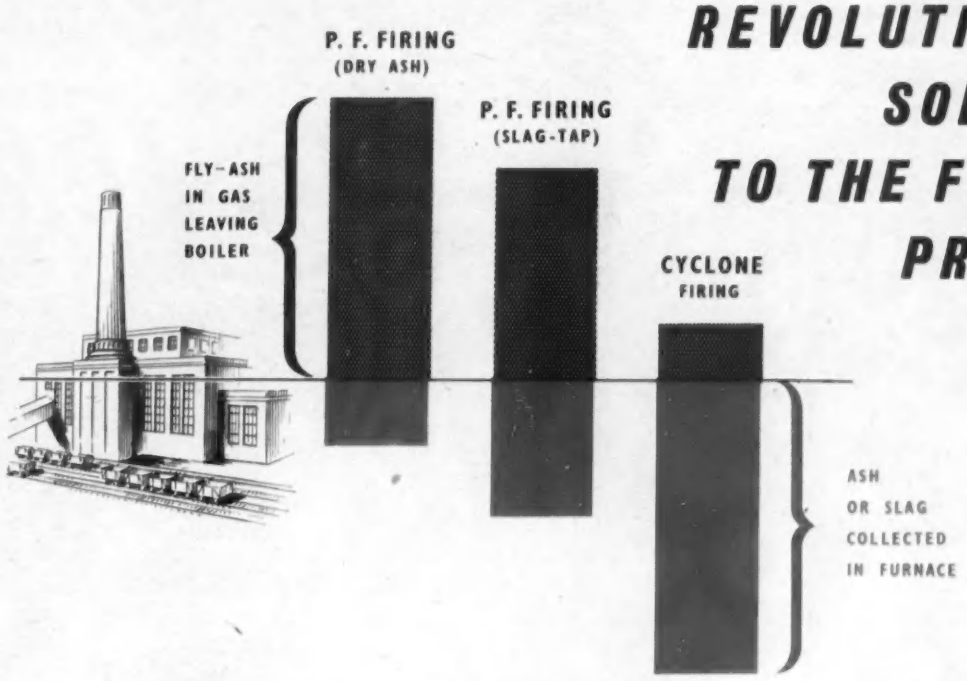
7 YEARS' PROGRESS

BRITISH ELECTRICITY

45 NEW POWER STATIONS

10,000,000 ADDITIONAL HORSEPOWER

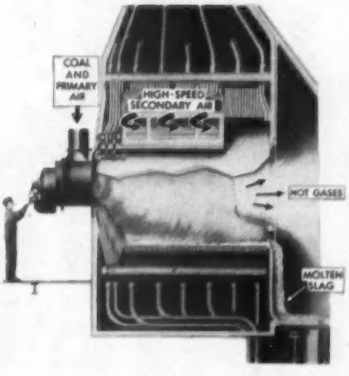
REVOLUTIONARY SOLUTION TO THE FLY-ASH PROBLEM



BABCOCK *CYCLONE* FIRING

OUTSTANDING advantage of the *Cyclone* furnace is the enormous reduction in quantity of fly-ash passing through the boiler. The major problems of ash collection and disposal and of stack emission are greatly simplified; while boiler efficiency and availability are increased by the reduction of slagging and deposits on the boiler surfaces. The *Cyclone* converts the ash to molten slag, which is quenched and easily disposed of.

A Babcock development, the *Cyclone* furnace, after many years of research and full-scale service, is now established as one of the most effective methods of coal-firing power station and large industrial boilers, with these further important advantages:—



The coal is borne into the water-cooled refractory-lined furnace by a stream of high-velocity primary air and meets a tangential stream of high-velocity secondary air, forming a vortex of flame in which the fuel is completely burned, the hot gases passing into the boiler. The temperature in the *Cyclone* is high enough to liquefy the ash which clings to the walls, forming a continuous coating of molten slag, which flows out of the furnace and is tapped into a water-filled tank.

Highest boiler efficiency due to efficient combustion, cleaner boiler surfaces, and lower power consumption for coal preparation—since the coal need only be crushed or coarsely pulverized.

Burns even poor grade, high-ash coals, at high combustion rates.

Due to high ash recovery and simpler ash disposal and coal preparation, removes various causes of heavy maintenance and shut-down; so further improving boiler availability.

Enables greater evaporative capacity to be obtained in less total space. Smaller boilers, with less ash and dust-collecting plant and other auxiliaries, can be housed in less costly buildings.

Ideally suited to simple, automatic combustion control. Safe in operation. Easily started up. Ignition stable under all load conditions.

Flexible in operation to meet wide load variations. Can be arranged for alternative firing with oil or gas.

Babcock & Wilcox Ltd. have under construction and on order, a number of *Cyclone*-fired boilers for both power station and large industrial installations.

ASK FOR PUBLICATION 1508/2

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BEAUTY — NEW EFFICIENCY

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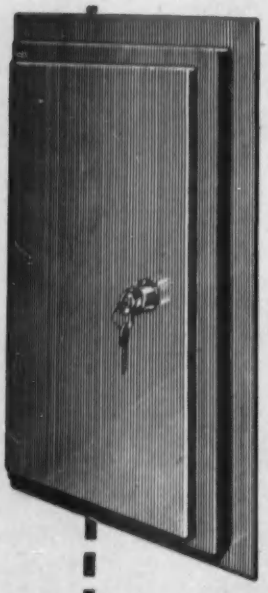

- Compact Design for Surface and Flush Mounting
- Easy Wiring and Installation
- Rewireable or H.R.C. Fuses
- Fuse Carriers of either type are Interchangeable
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- Door secured by Snap Fastener and Lock. Concealed Hinges
- Designed for Internal Fixing
- Finished in Grey Durable Enamel

ORDSAL FLUSH TYPE 500 VOLTS
15/30 amps. 60 amps. 100 amps.

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MANCHESTER 5 and also at LONDON
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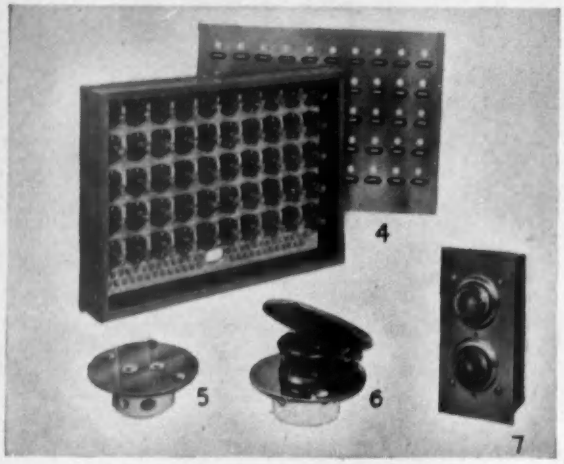

4 *Multi-way Luminous Indicator*
5 *2-Pin B.S.S. Flush Socket*
6 *2- and 3-Pin Spring Hinged Cover Socket*
7 *Domed Glass Luminous Section Indicator*

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Polyvinyl Chloride
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Great dielectric strength (10,000 volts). Smooth plastic surface. High elasticity. Ultra endurance.
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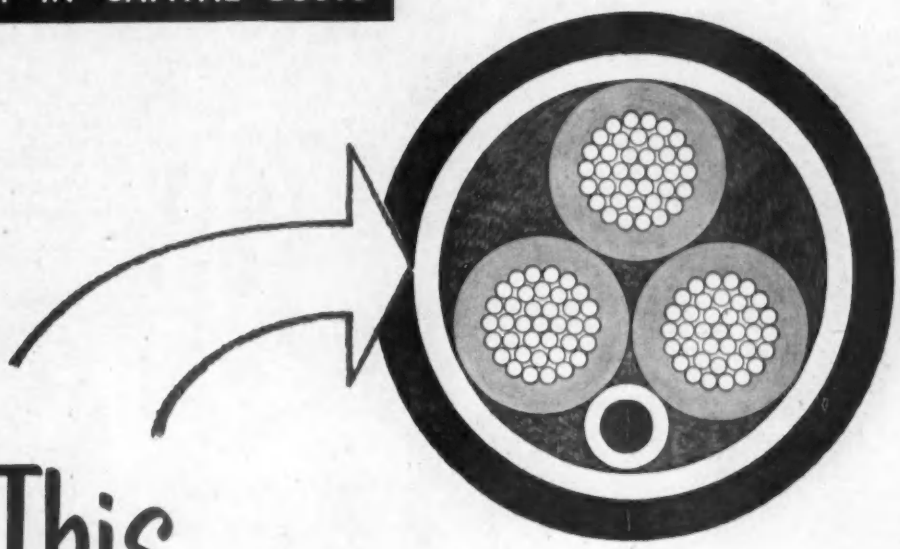
Telephones: EUSton 8501 (6 lines)

ECONOMY IN CAPITAL COSTS



This Aluminium Sheath ...

performs the functions of a normal lead sheath PLUS a reinforcement against the internal gas pressure, and a mechanical protection — providing economy in materials and lightness in construction.

SOME TYPICAL INSTALLATIONS

London Electricity Board
10,690 yards laid between Perth Road Sub-Station and Buckhurst Hill Sub-Station.

Midlands Electricity Board
9,310 yards laid between Halford Lane Sub-Station and Handsworth and Freeth Street Sub-Station, Birmingham.

South East Scotland Electricity Board
Contract placed for 6,120 yards to be laid between Townhill Power Station and Netherton Sub-Station, Fifeshire.

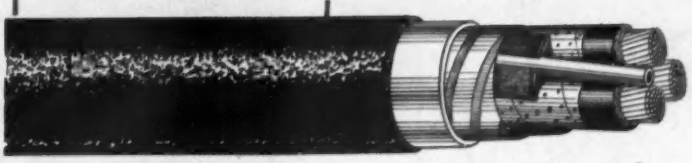
Brisbane City Council
Order in hand for 31 miles to be delivered to Australia.

Aluminium Sheathing is a notable advance in pressure cable manufacture.

Elimination of a separate reinforcement simplifies jointing, while the lighter weight makes the cable more convenient to handle, reducing transport and installation costs to a minimum.

Because of this, BICC 33kV Aluminium Sheathed Impregnated Pressure Cable can offer a saving of up to 25% in initial costs compared with solid types.

Further information is available on request.



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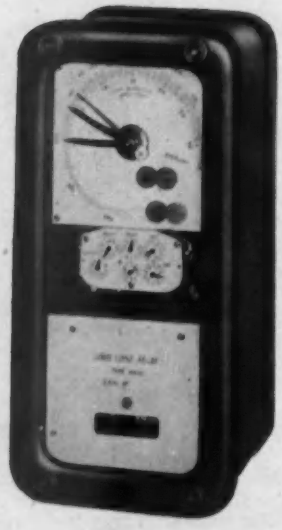

Types MASA and MASI Relays. For the limitation of kVA demand.

Type NJO4 Relay for the Automatic Control of the Single-stage Capacitors used for power-factor improvement.

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Enquiries to: TELCON WORKS, GREENWICH, S.E.10. *Tel.:* GREenwich 3291

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Strongly constructed portable steel case with lifting handles, adequately ventilated, finished in attractive grey "hammer finish" enamel.

DIMENSIONS. Height 17½" × length 20" × width 12½".

WEIGHT. 34 lb.

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Continuous and smoothly variable from zero to 2,500 volts by means of continuously variable regulating transformer.
The test voltage is applied smoothly without high stress from voltage surges.

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A miniature magnet circuit breaker in the primary circuit and double pole on-off switch with double pole mains fuses provide perfect protection.

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A high grade instrument connected in the primary circuit but scaled to read output voltage.

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Amber indicates when mains switch is turned ON. Red indicates when high voltage control is raised from zero.

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Heavily insulated and shrouded spring loaded test prods protect the operator. The Transformer is double wound and fitted with a copper screen between windings. A substantial earthing terminal is provided to which the chassis, cubicle and inter-winding screen are efficiently grounded.

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2·5 kV at 500 VA INSULATION TEST SET

PRICE: £38. 10. 0.
complete with test prods.

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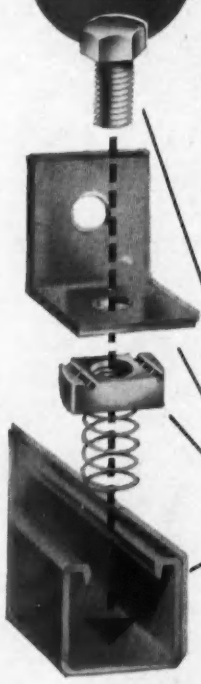
THE QUICKER EASIER WAY TO FRAME, HANG & SUPPORT ALL ELECTRICAL, PLUMBING, HEATING AND VENTILATING EQUIPMENT

COMPLETELY ADJUSTABLE • NO DRILLING • NO WELDING • NO DETAIL DRAWINGS REQUIRED • "UNISTRUT" SAVES TIME, LABOUR AND MONEY

HOW TO BUILD WITH UNISTRUT

"Unistrut" Channel with Continuous Slot
Wedge Shaped Inturned Edges to take Serrated Grooves of "Unistrut" Nut.
"Unistrut" Locking Nut with Serrated Grooves.
Serrated Grooves "Bite Into" Inturned Edges of Channel for Positive Location.
Insert Locking Nut anywhere Along Continuous slot of Channel . . .
Rounded edges of nut permit easy insertion Spring (your third hand) holds nut snugly in place for bolting.
Assemble Fixting, Nut and Bolt—a turn of the spanner, it's done

THE BASIC COMPONENTS



THE BASIC COMPONENTS

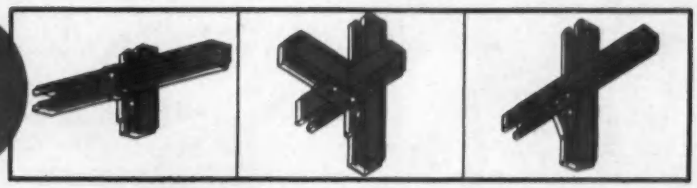
Unistrut Bolt
$\frac{1}{2}$" and $\frac{1}{4}$" sizes.

Unistrut Framing Fittings.

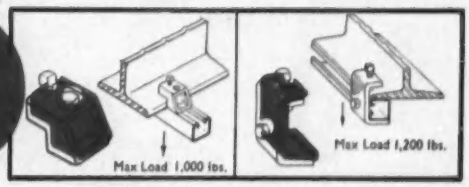
Unistrut Locking Nut.

Unistrut Channel 12 gauge 10'-0" and 20'-0" standard lengths.
Standard finish - Bonderized and stove enamelled olive green. Also available galvanized or plain, oil protected.

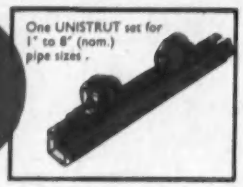
FRAMING FITTINGS



BEAM CLAMPS

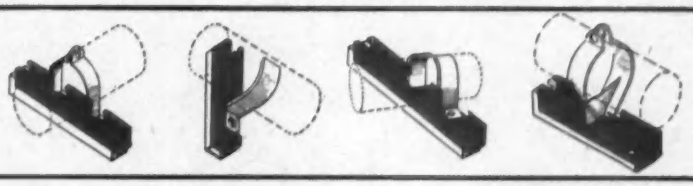


ROLLER PIPE SUPPORTS

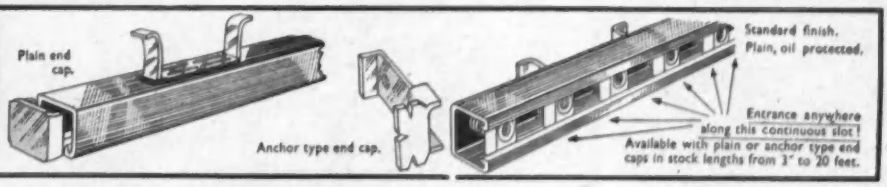


CABLE PIPE AND CONDUIT CLAMPS

There is a UNISTRUT Clamp for $\frac{3}{4}$" to 8" (O.D. or nominal).



CONCRETE INSERTS


Plain end cap.
Anchor type end cap.
Standard finish. Plain, oil protected.
Entrance anywhere along this continuous slot!
Available with plain or anchor type end caps in stock lengths from 3" to 20 feet.

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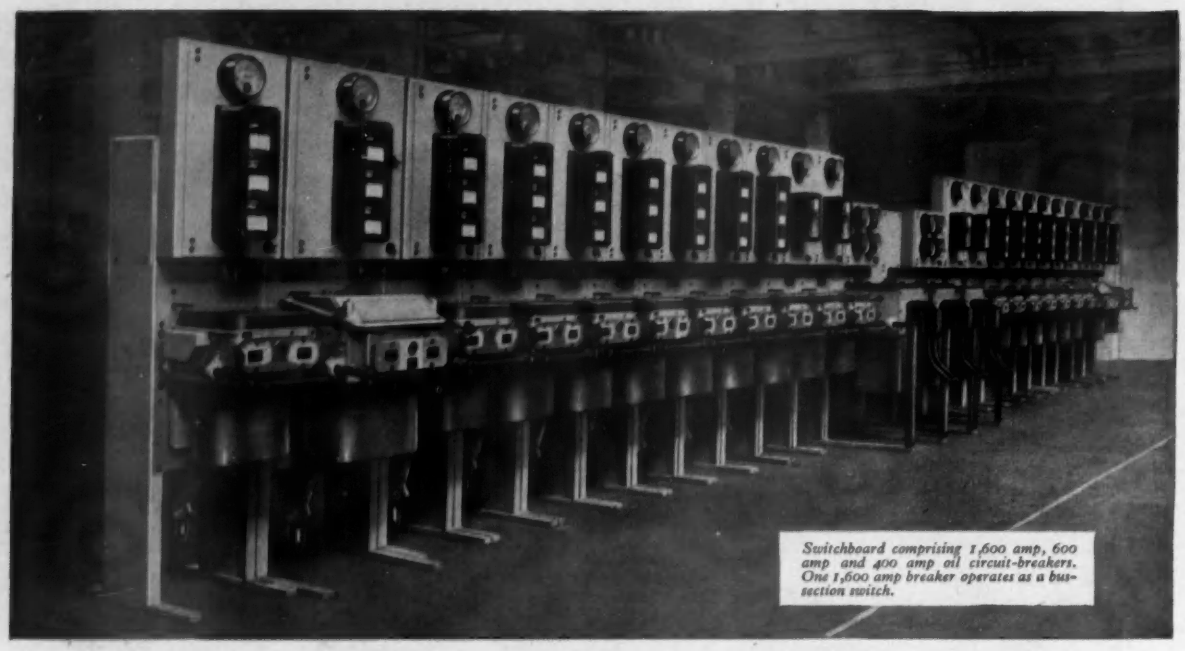

Switchboard comprising 1,600 amp, 600 amp and 400 amp oil circuit-breakers. One 1,600 amp breaker operates as a bus-section switch.

J. & P. LOW VOLTAGE SWITCHGEAR

These two switchboards supplied to the Iraq Petroleum Company are typical of J. & P. low voltage oil-break switchgear. Designed and A.S.T.A. certified for ratings up to 2,000 amp, 30 MVA, this gear can be supplied with horizontal isolation if required. Power closing mechanisms are available for the higher current ratings and rupturing capacities.

JOHNSON & PHILLIPS LTD., CHARLTON, LONDON, S.E.7

Duplicate busbar L.T. Switchboard having off-load bus-selector switches and using 1,000 amp and 400 amp oil circuit-breakers.

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calls for RAPID · ROBUST · RELIABLE

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The highly successful system of multi-pin connectors pioneered by Plessey in the radio, electronic and aircraft electrical fields lends itself most aptly to their use in all situations where temporary and mobile power connections are required. A new range of specially designed HEAVY DUTY Plugs and Sockets, accurately machined in forged aluminium bronze, capable of withstanding rough handling, is now available for incorporation in temporary power distribution equipment where rapid, frequent and reliable interconnection is essential.

BASIC TYPES

The range includes a fixing PANEL UNIT—a PANEL MOUNTING COUPLER and a CABLE COUPLER—each designed to mate with the common CABLE UNIT (as illustrated).

PIN COMBINATIONS

All types are available with the following contact combinations:

22-way—10 amp; 4-way—50 amp; 3-way and 1 Earth return—50 amp.

SPECIFICATION

Working Volts: 440 v. A.C. Proof Voltage Test: 1880 volts. Contact Resistance: 1 milliohm. Insulation Resistance: All pins to earth, 100 megohms.

These connectors comply with the M.O.S. specification for climatic proof components.

HEAVY DUTY PLUGS & SOCKETS

Publication No. 731 giving full information on the complete range of Plessey Heavy Duty Connectors is available to manufacturing and Government Department executives and to design engineers, free on request.

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If you have an electrical insulation problem, send it to us! Our Test and Research Department will be pleased to advise you.

In addition to the silicone elastomer coated glass insulation, which we have been producing now for two years, we have just begun the manufacture of Silicone Elastomer Impregnated Glass Cloth.

This material is available in thicknesses from 3 mils to 20 mils, in rolls 36″ wide or in tapes of any width, and in both straight cut and bias cut form.

The bias cut tape provides a flexible Class H insulation, more suitable for taping round bends than previous materials of this type. By using an elastomer, rather than a Silicone varnish, a softer insulation is produced—one that does not crack when creased or doubled back on itself.

For tested flexible insulation—say SYMONS for sure!

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H. C. ELECTROLYTIC COPPER WIRE, BARS AND STRIP
By
Spencer Wire
THE SPENCER WIRE CO. LTD., THORNES WIRE MILLS, WAKEFIELD, YORKS.

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"YOU CAN FOOL ALL OF THE PEOPLE SOME OF THE TIME — You can fool some of the people all of the time, but you cannot fool all the people all the time."

So said Mr Abraham Lincoln in his speech at Clinton, U.S.A. on September 8th 1858—

—but we are not fooling ourselves or anyone else when we state that the " POP " Riveting system is outstanding in its principle of one operation by one operator from one side of the material. " POP " Rivets can be used in almost inaccessible places. We would not fool you even if we could, and at any rate with the " POP " Riveting system there is no occasion to try, the system speaks for itself.

Let our technicians give you their advice.

" POP " is a Registered Trade Mark of the manufacturers.

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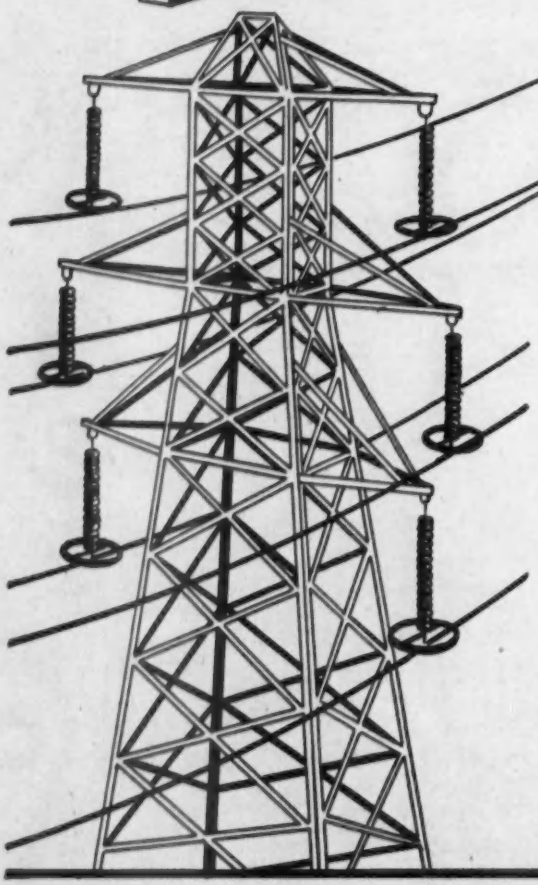
WANDLESIDE

ALL ALUMINIUM INSULATED OVERHEAD CABLES



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Take advantage now of the price and prompt delivery of Aluminium

Send your tender enquiries and ask for samples NOW for PBJ and HSOS Cables manufactured under the supervision of EXPERT PRACTICAL men of long-standing in the Industry.

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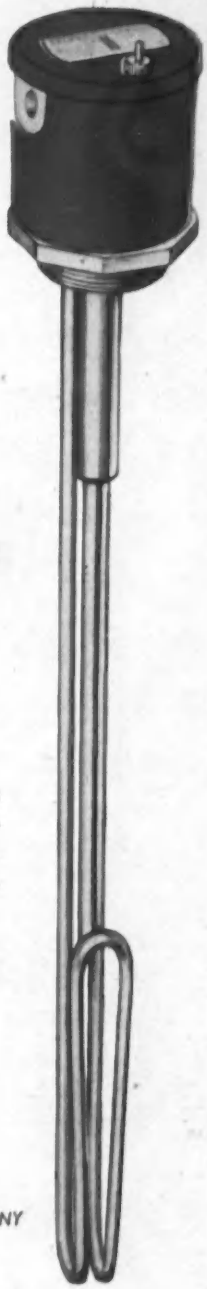
2 into one will go!



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on lowest price, highest quality (complies with B.S. 1556)

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again with the 'Double-D'—a new version of the Redhead, with a thermostat pocket made double diameter width to accommodate either conventional rod type thermostats . . . or the new, large-diameter, short-stemmed types! Write to us for lists—WH2050/WH2052.

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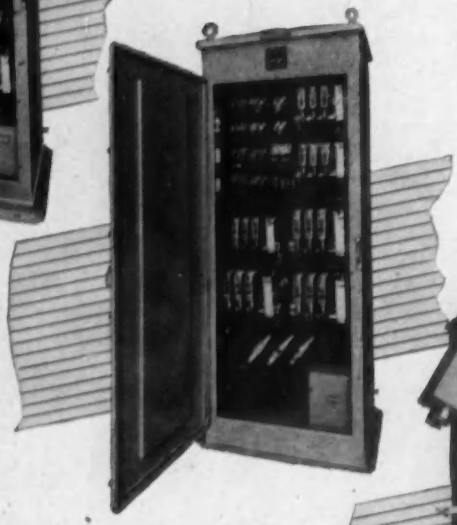
Double "D" Redhead

A **Creda** PRODUCT

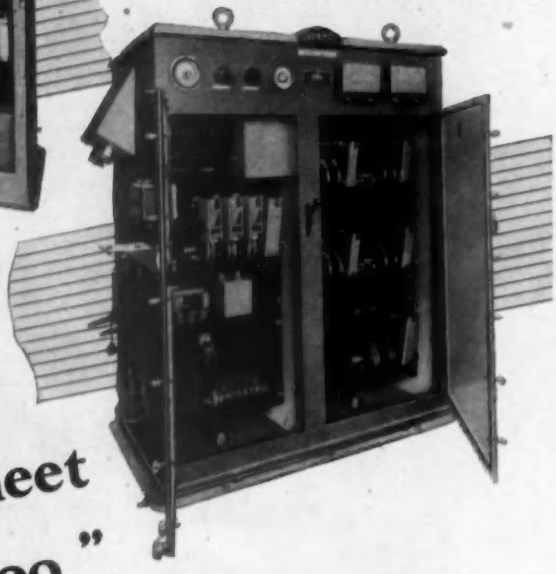
MADE BY THE HOUSE OF **Simplex** A COMPANY

Simplex Electric Co. Ltd. Creda Works Blythe Bridge Staffs

Wheel lathe multi-motor control panel. Includes 40 H.P. stator-rotor starter (main drive) with slow-down feature to reduce speed when turning wheels with hard spots.



Two-motor panel for controlling turret lathe. Main motor is star-delta started in high speed and straight-on started in low speed.

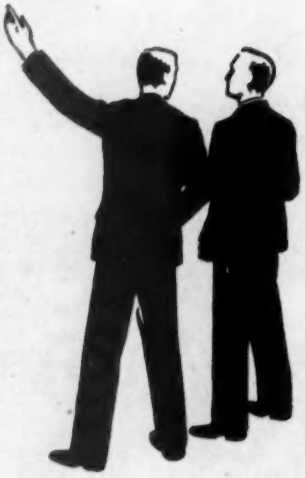


180 H.P. automatic stator-rotor starter for pump drive. Enclosed in weather-proof case. Forms part of complete transportable pumping unit.

" Special equipment can be designed to meet your requirements too "

Illustrated are typical Special Design control panels for applications demanding variations outside the scope even of the Brookhirst Comprehensive Range. Brookhirst have the experience and manufacturing facilities to deal adequately and economically with all such requirements. It is their daily routine to consider diverse installations individually, to provide control gear to strict specification, yet generally to build up 'Specials' from standard components — greatly to the user's advantage in cost, ease of maintenance, and delivery time.

Brookhirst Engineers can usually offer time-and-money-saving recommendations wherever special controls are needed. Perhaps we could assist you ?



BROOKHIRST SPECIAL DESIGNS FOR ALL FORMS OF CONTROL

BROOKHIRST SWITCHGEAR LIMITED CHESTER

A METAL INDUSTRIES GROUP COMPANY

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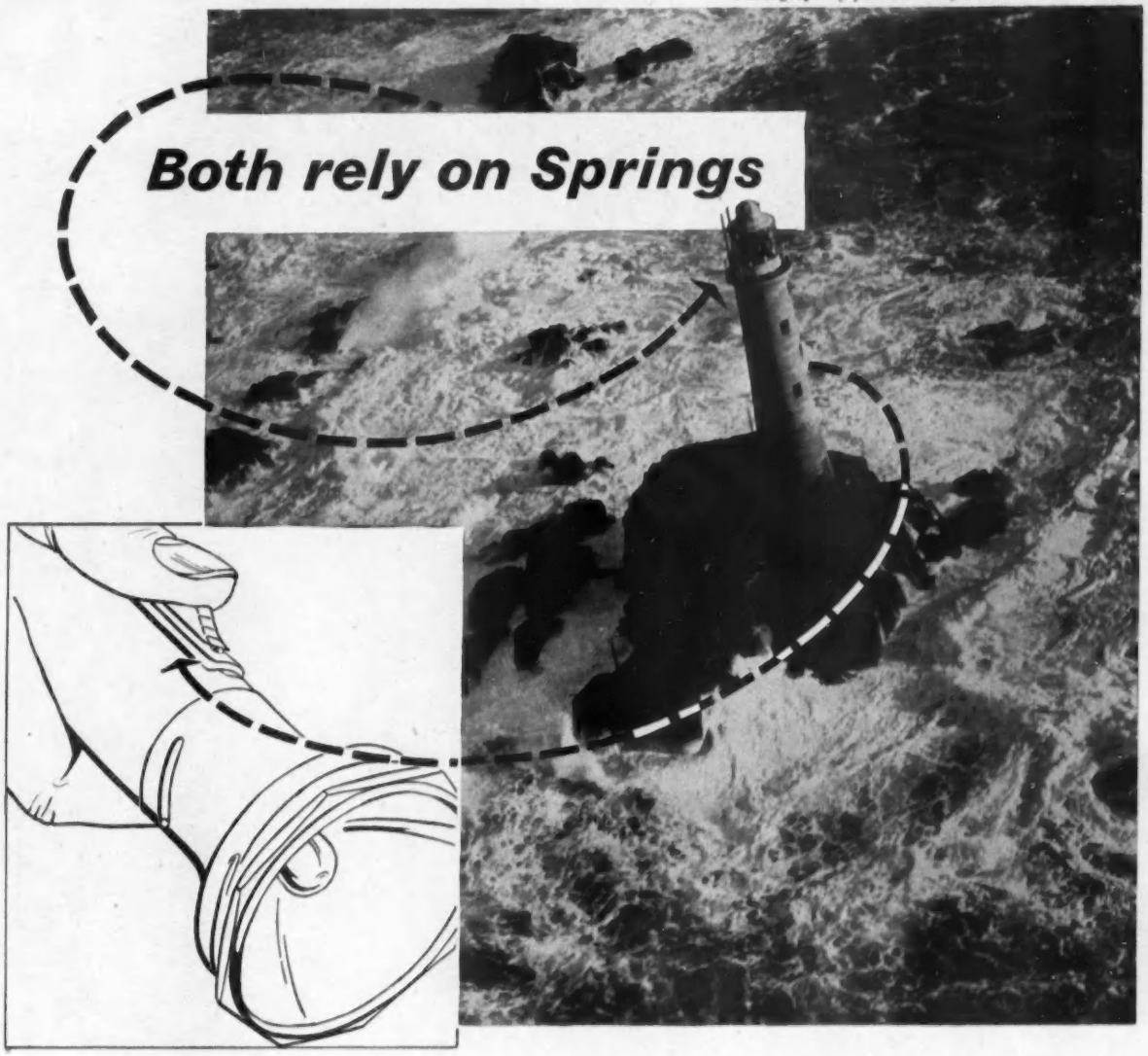

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From the high precision springs required for the mechanism of a lighthouse to the simpler counterpart in a hand torch, the right spring for the job is essential to ensure perfect performance. When your springs are designed and made by Salter, they are just right — not the cheapest obtainable but fit to work for ever.

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A tradition of quality in craftsmanship and materials is embodied in every Salter spring — you can depend on Salter for the *right spring for the job.*

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M-W/397

'Superform' fuse switchboards

for the control of MEDIUM VOLTAGE circuits

Incorporating H.R.C. CHASSIS TYPE FUSE-SWITCHES in ratings up to 750 amps.

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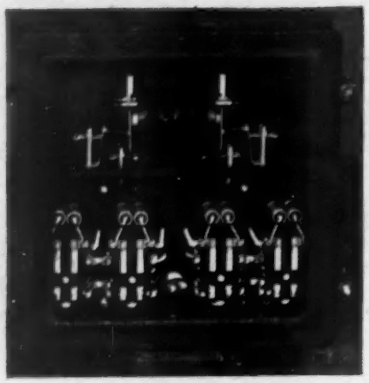

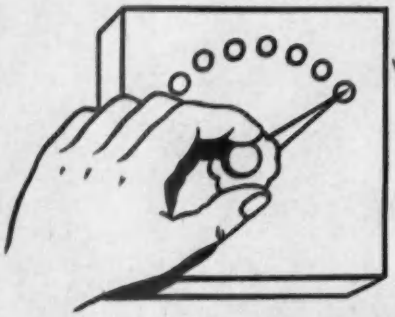

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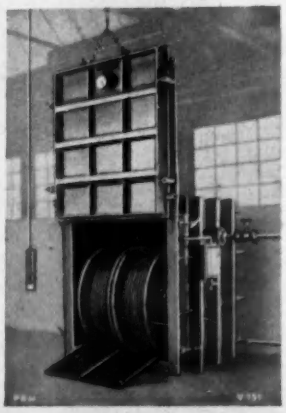

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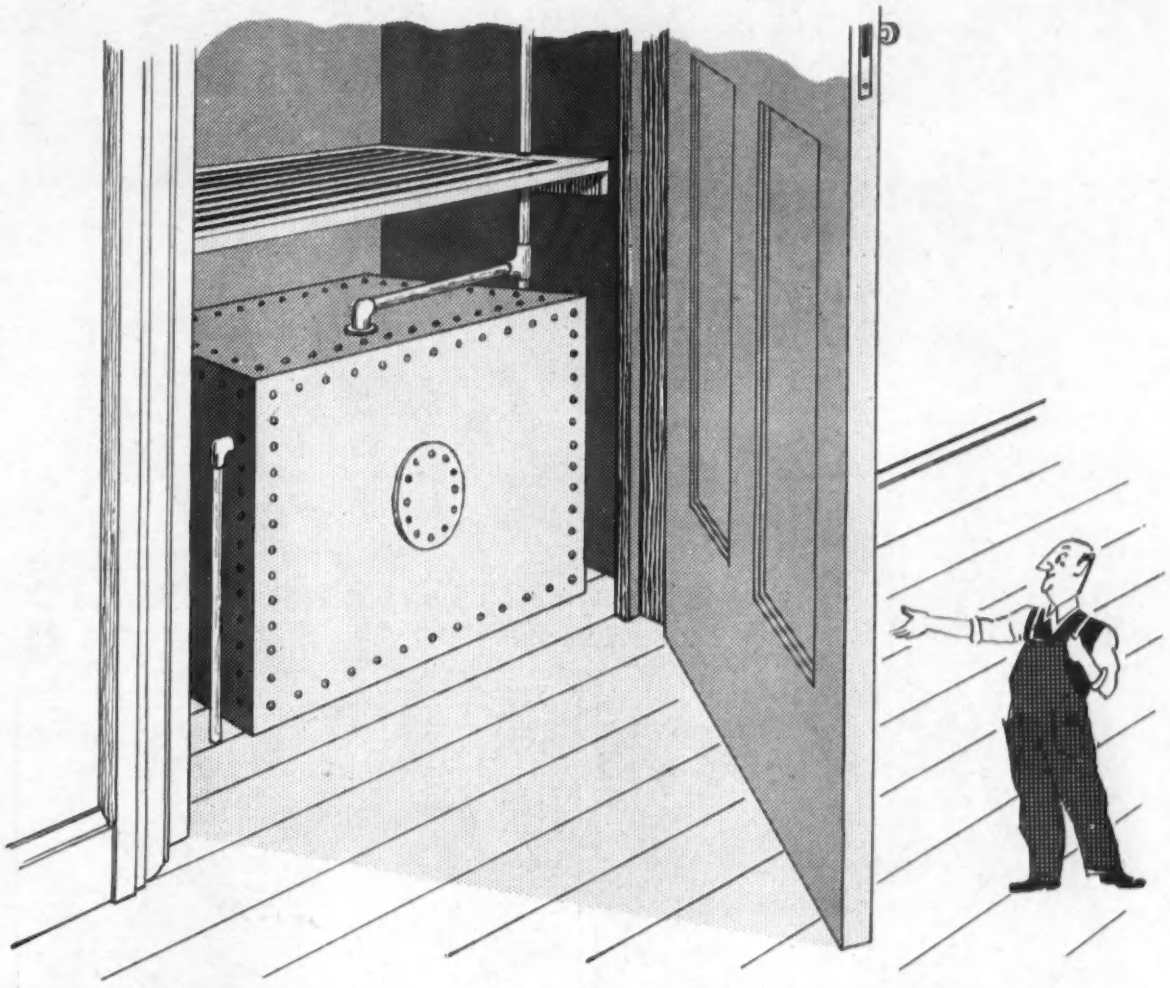

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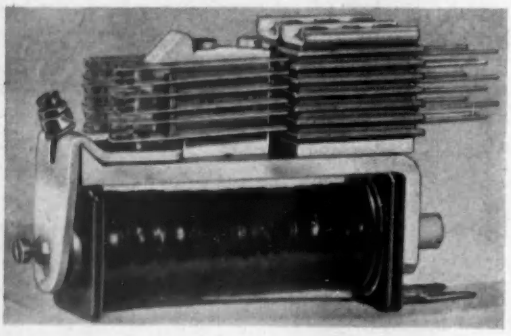

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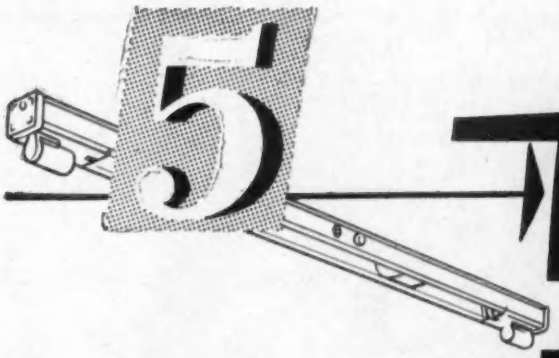

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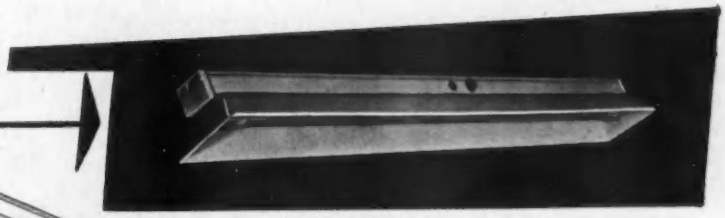
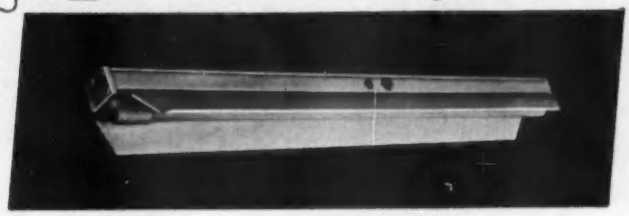
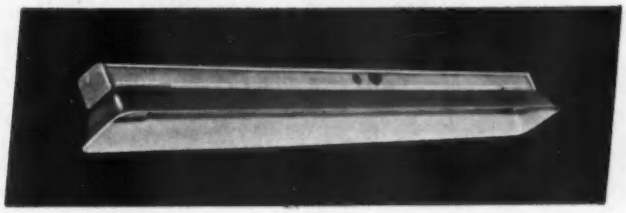


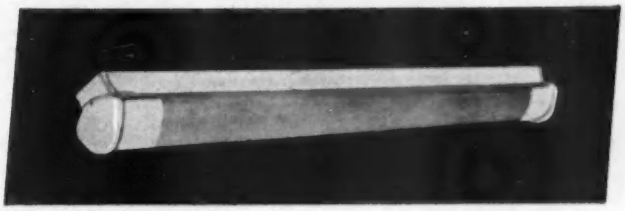
1 *Closed End Metal Trough*



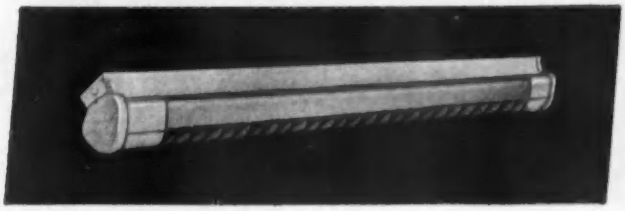
2 *Open End Metal Trough*



3 *Closed End Translucent Trough*



4 *Enclosed Unit (1-lamp)*



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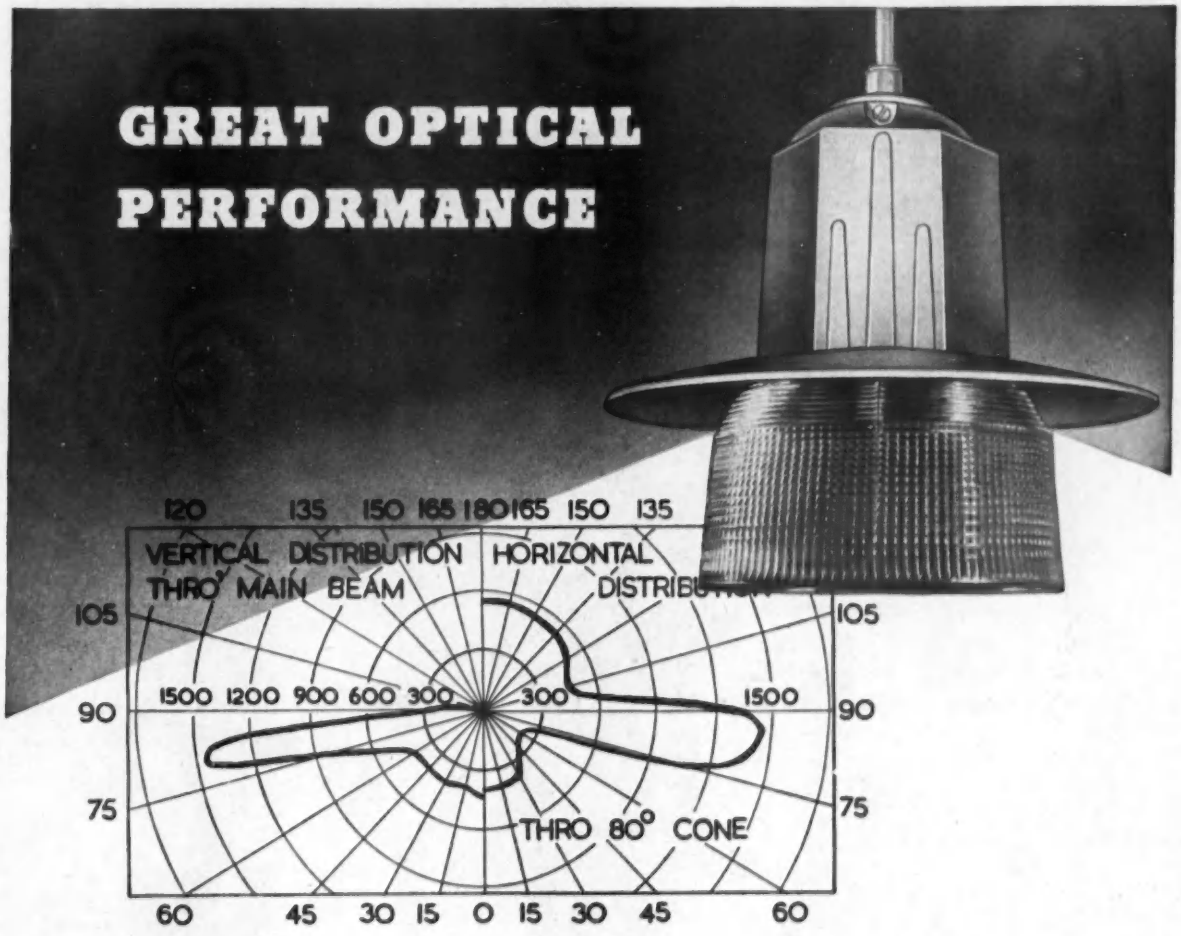

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ELECTRICAL TIMES

ESTABLISHED 1891

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D

WATCHDOGS FOR PARLIAMENT

Members of Parliament have voiced discontent with the degree of contact they have with the nationalised industries, ever since the Coal Board was formed. Until last week, however, only two approaches were possible in the House of Commons. Questions could be put to responsible Ministers on a limited range of subjects, and very occasionally a full-dress debate was staged at which the accumulated annual reports of an industry were considered. Now a more intimate arrangement has been made. A Select Committee has been set up, and 13 M.P.s now have the duty of examining the reports and accounts of the nationalised industries and of obtaining "further information as to current policy and practices." Obviously no one industry, for example, electricity supply, is likely to come under enquiry at very frequent intervals, unless it gains unwelcome notoriety for some reason. Moreover, when the Committee do direct their attention to an industry, they are to be severely limited in their enquiries. Matters which concern Ministers, and any on which a Minister has chosen to intervene, are excluded from the Committee's consideration. So also are details of wages and conditions of employment; the sacred "matters of day-to-day administration"; and those details for which Parliament has by Statute provided formal machinery. Yet although the Committee, hamstrung in this fashion, is unlikely to produce outstanding results so long as responsible Ministers keep a proper hold on nationalised affairs, they may still serve a useful purpose. Thirteen M.P.s will have read an industry's report and discussed it with Board members and senior officials. If the nationalised industries make the best use of their opportunity, Members should be in a position to appreciate both the aspirations and the difficulties of the controlling boards, and will be ready to speak of them to the House when formal debates make reference relevant. While by no means an ideal solution to the problem tagged "accountability to Parliament," the small and restricted Select Committee may prove a valuable instrument in keeping the House of Commons informed of the progress of the corporations it has created.

TRADING WITH CHAINS

An attack on chain store trading was made by the President of the Electrical Wholesalers Federation at the annual dinner last week. This reflected the concern felt by both retailers and wholesalers at the continuing growth of store trading and the restiveness of manufacturers in the face of their unbridled competitors. So seriously is the present

situation viewed, that Mr Crisp did not hesitate to suggest the possibility in the near future of wholesalers and retailers agreeing to refuse to distribute manufacturers' products if they are also supplied to chain stores. This may well prove a double-edged weapon, for the operation of any kind of stop list is frowned upon in these days, and among the smaller manufacturers, the attractions of bulk selling with central delivery and prompt payment may prove irresistible. None the less the dangers of committing bulk production to single buyers are well known and fortunately manufacturers in the electrical industry sufficiently appreciate the facilities of normal trade channels to prevent the situation becoming out of hand.

MORE TARIFFS WANTED

Standardisation and simplification of retail tariffs was one of the principal duties which the 1947 Electricity Act laid on the supply industry. After seven years' work on this most intractable problem, most area boards are well on the way to attaining uniformity throughout their areas, while nationally, the number of different tariff structures has been reduced. The progress made and prospects for the future are reviewed in a paper presented to the I.E.E. last week, under the joint authorship of Mr A. O. Johnson and Mr N. F. Marsh. This paper does not, however, discuss to what extreme it is desirable to push standardisation. There are obvious advantages in having uniformity within any one board and similar tariff structures in neighbouring area boards, but this must not be taken to imply that "standardisation and simplification" automatically necessitates reduction in the number of tariffs to one per major class of consumer. It has long been argued in these columns that a multiplicity of available tariffs runs parallel with the efficiency of an undertaking, provided the tariffs are closely related to the requirements of individual classes of consumers with the object of encouraging demand. Throughout the present paper there is indirect support for this view. It is particularly apparent when, having described the full range of tariffs dealt with by the supply industry's Retail Tariffs Committee, the authors move on to consider the needs of long-hour off-peak consumers: but there are many other potential loads which merit the cost of accounting-inconvenience as the price of attracting increased electricity consumption. The right path for tariff design seems to be from pre-vesting confusion down to the present rather narrow standardisation, then branching out from this bridgehead into several rationally related one-purpose tariffs.

DIFFERENCES IN RESULTS

Work in laboratories in different countries is notoriously difficult to correlate, but there can seldom be such a wide gap between results as that revealed by last week's I.E.E. paper on the high voltage d.c. testing of large stators. American reports had suggested that this method offered a non-destructive technique for finding weaknesses in the windings, where breakdown would occur on a.c. over-voltage tests. Check experiments in this country, as reported in the paper, seem to show that these claims are completely unfounded. This incident remains a striking illustration of the dangers of accepting unchecked, seemingly conclusive results.

NEW STANDARDS FOR THE CLERK

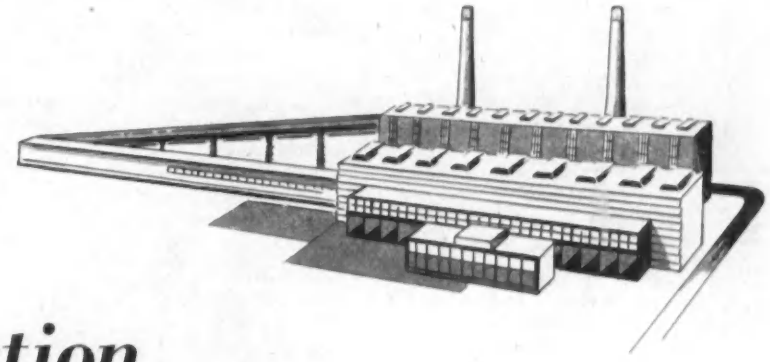
Since the early part of the nineteenth century, Parliament has given its attention to legislation dealing with conditions of work in mines and factories. The scope of the respective Acts has been gradually extended, but those whose employment lies in offices and in some other commercial premises have always been outside their protection and restrictions. The Non-Industrial Employment Bill, a Private Member's measure scheduled for debate next week, seeks to remedy this neglect along lines proposed by a Government Committee who reported in 1949. Amongst the proposals which the Bill contains are two of potential importance to the electrical industry. First and foremost, attention is given to the level of lighting, artificial as well as natural: the minimum standard of lighting at places where clerical work is carried out is set at 20 foot-candles, a level which must be appreciably beyond that available in many older offices. For drawing offices, the minimum is further extended to 30 foot-candles, but perhaps here the change is unlikely to be so great. The second point of electrical interest is that a firm requirement for heating is written into the Bill: means must be provided to maintain a temperature of at least 65° F. In older offices, such a standard would underline the attractiveness of electric heating, which can bring about a great improvement in comfort with minimum structural disturbance for installation. Unfortunately, however, there is a looseness of definition about both these requirements, and in many other parts of the Bill, which reflects to some extent the unsuitability of so important a subject for private members' legislation; but it may draw a statement of the Government's intentions.

FINLAND'S POWER SHORTAGE

It is always salutary to view the electrical problems of another nation and the methods adopted for their solution. Finland, the country selected for this year's Caroline Haslett Trust Lecture presents in many ways a unique case. A most severe power shortage, aggravated by the loss of the largest power station in the ceded territory of the Karelia, is allied to an inflatory monetary system. As a consequence comprehensive measures have had to be taken to restrict consumption of electricity by all possible means. Tariffs for space heating and for water heating have been made virtually prohibitive, while the load of cookers has been restricted to figures well below those acceptable elsewhere. The effect of inflation is strikingly thrown up by the system which has been adopted for prepayment meter users. Token coins have to be purchased at the local milk shop. The selection of the milk retailer as a vendor is bound up with the absence of any house milk delivery, which implies that the majority of urban and village dwellers have frequently to visit the shop for supplies of fresh milk. Only thirteen coins, representing 26 units, may be purchased at a time, as a means of restricting consumption. Thus the price of tokens can be varied in line with the changing currency and at the same time consumption is restricted by inconvenience provided to the householder. It is not unexpected that by far the greater number of consumers prefer quarterly meters.

Meteor

BUILDING A POWER STATION PART TWO



Site Selection Set Sizes and Consents

OBTAINING a site for a power station may be likened to an obstacle race in which the runner is not racing against other competitors but is confronted successfully and simultaneously with physical, legal and economic obstructions which vary continuously in magnitude and difficulty and require tact, persistence and knowledge to overcome them. In many cases a promising start leads to insuperable difficulties and failure results, in others opposition may unexpectedly melt away.

In this article, the second dealing with planning a power station, the aspect of site selection is considered at somewhat greater detail than in the first of the series.

Readers of that article will recall that the Divisions have the responsibility for prospecting for and reporting on sites sufficient to meet the broad requirements for power within the Divisions for the following 10 to 15 years. The internal arrangements for undertaking this task naturally vary from Division to Division, but in the Southern Division, with which we are principally concerned, site selection is delegated to the Generation Engineer (Construction) whose department contains a section primarily devoted to this work. Advice is sought from the Generation Engineer (Operation), the Divisional Secretary, the Technical Engineer and the Divisional Purchasing Officer as required.

Strategic Factors

The most important factor in selecting a station site is, of course, the location of the load to be supplied. In our previous article we dealt with load forecasting and showed how estimates of potential load demand were derived. From these figures, on a local basis, the optimum position for a site may be derived. It may be that at this location there already exists a site which has been earmarked as a possibility by the Division concerned. If this is not so, action is taken to carry out an investigation of the area to find if a practical site exists, and if this fails other methods of supplying the load must be sought.

The second main strategic factor is the location of the coal supplies which will be required. Near or on the coalfields, electricity can be produced in a modern high pressure station, at a cost of about 0·3d. per unit sent out, but an equivalent station located say in Berkshire could not be expected to generate at less than 0·5d. A similar station located on the south coast would have a slightly lower figure. The difference in price is due to transport charges, and a balance must be struck between the cost of supplying the load by a local power station, with high coal transport charges or supplying it from a distance by electrical transmission with associated losses from a station better situated with respect to the coalfields. For inland stations, rail or road—with possibly canal—are the only transport methods. Whilst road transport of the complete coal requirements is not generally practicable, except for small stations, rail transport requires extensive sidings and tipping equipment. The most desirable method of long distance transport is by sea and estuary and coastal sites are, from this point of view, desirable.

It can thus be seen that the problem of coal supply naturally varies between individual Divisions, and the following remarks apply to the Southern Division which has no coal within its boundaries. Several sources can be used to feed the division—seaborne coal from the north-eastern, eastern and Welsh coal ports; railborne coal from the inland East Midlands coalfields, and a limited quantity of road or rail transported coal from the Bristol and Somerset areas. Taking into consideration the magnitude, location and the type of load to be supplied, and bearing in mind that an overshadowing feature of power station design and operation is the often very high proportion of total production costs represented by coal charges, which may in some cases be 50%, a number of sites in the vicinity of Southampton Water were investigated and, as the result of an economic comparison, Marchwood was ultimately selected. There are, of course, other sites within the division which have been earmarked for development.

Cooling Water

The third factor, which we have already considered briefly in our previous article is cooling water. Three considerations are involved in the quantity of water required: the quantity of steam required to be condensed, the

The first part of this series appeared in our issue of 6th January.

Fig. 1. Some of the occluded boulders found in the strata when pile driving began. These proved to be remarkably hard and caused considerable difficulty

exhaust pressure of that steam, and the permissible rise in temperature of the circulating water. The two last factors can be taken as fairly constant for British stations. The most important consideration, is the quantity of steam exhausted. This tends to become less per kWh as the turbine inlet pressures and temperatures increase, due to higher cycle efficiency. The quantities of water required are extremely large, being between 10 and 20m gallons of water per hour for a 360 MW modern station. The size of this demand makes it essential in many inland sites to adopt cooling towers which implies a slightly lower thermal efficiency and requires a greater amount of land. Even cooling towers require substantial amounts of makeup water, equivalent as a general rule to about 2% of the water circulated. For a modern 360 MW station this works out at about 170,000 gallons per hour, and is generally available from any river of reasonable size. Purging has to be carried out at regular intervals to maintain a defined level of chemical purity and the purged water, while at the condenser c.w. inlet temperature, may be a few degrees higher than the river. This temperature difference, although small, is somewhat higher than with direct circulating water systems, and is difficult to evaluate with precision. Much recent work has however been carried out on cooling tower calculations.

The appropriate river board, of which there are 32 in Great Britain, is concerned with the temperature, composition and quantity of all discharges into non-tidal waters. Application for consent for a projected discharge is made to the river board, but if the conditions imposed are too stringent appeal may be made to the Minister of Housing and Local Government under section 7 (10) of the Rivers (Prevention of Pollution) Act 1951. The provisions of the Salmon and Fresh Water Fisheries Act may also need consideration.

In addition to water from rivers, sewage effluent, if available, can be used, and has the advantages of more consistent flow, and uniformity of quality. The effluent from a modern sewage works is often cleaner than the river into which it is discharged. Several existing power stations already use sewage effluent in considerable quantities for cooling water make-up purposes.

Attributes of a Good Site

From a technical aspect, the attributes of a good site therefore, include proximity to a substantial source of cooling water, preferably near a river or on the coast, and consequently the question of flooding must be explored. This is not too difficult as usually data is available on tidal or river flood levels from the appropriate authorities.

The site should be reasonably level and have an adequate area of ground available. The ratio, however, of station capacity to site area varies over a wide range in terms of MW/acre. This must essentially be so, as potential sites are generally earmarked well in advance of the formulation of the precise capacity capable of being supported. When this is approximately known, there is always the possibility of the subsequent erection of a second station on the same site. The technique of legislating for "A" and "B" stations in the early stages enables full advantage to be taken of technical developments, and also provides for savings in the construction of common civil engineering work and land purchase. For inland rural sites, however, a figure of somewhere about 1 MW/acre may be taken, as provision has to be made for coal storage and handling plant, ash disposal, railway sidings and probably cooling towers. The figure, however, rises rapidly for urban sites and in cases where cooling water is available in bulk and coal can be seaborne, may attain—with large sets and unit boilers—magnitudes of over 100 MW per acre. At Marchwood where the land consisted of saltings and rough pasture, with ready availability of cooling water and some ash disposal on site and the balance locally, the density is about 2·69 MW/acre.

Much valuable information can be obtained on subsoil conditions from geological maps and surveys, but these can only be a rough guide, it is normally necessary to take out test borings

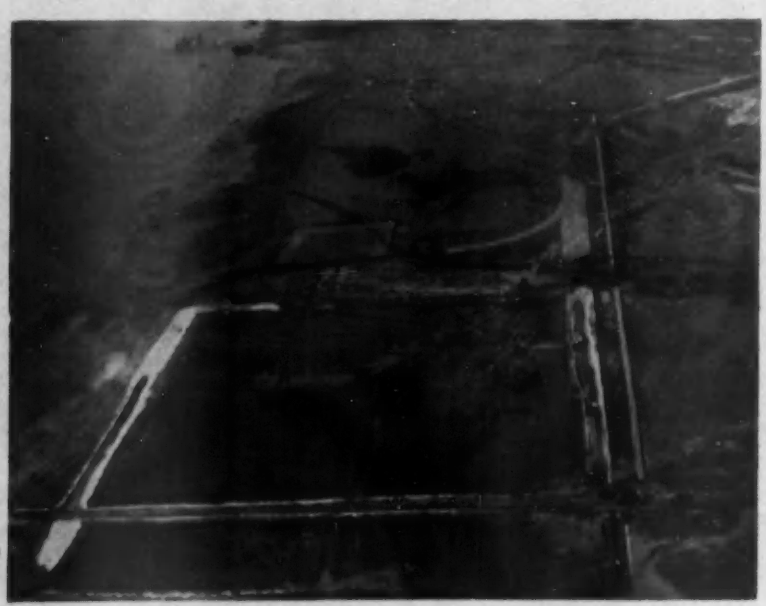


Fig. 2. Preliminary work on the Marchwood site. This view shows the marshy and water logged ground of which the site was composed. The area of the site extends to the top of the picture

to ensure that the substrata are capable of bearing required loads and to provide for foundation design. Even so some difficult problems can subsequently arise. At Marchwood, for example, based on Bracklesham beds, which consist of gravel and clay, occluded boulders which seriously interfered with the civil engineers progress were found during the piling and foundation work. The size of these is well shown in the illustration (Fig. 1). Too much reliance cannot be based on theoretical laboratory tests on subsoils but enough is now known about soil mechanics to provide a reasonable guide to behaviour under various loading conditions.

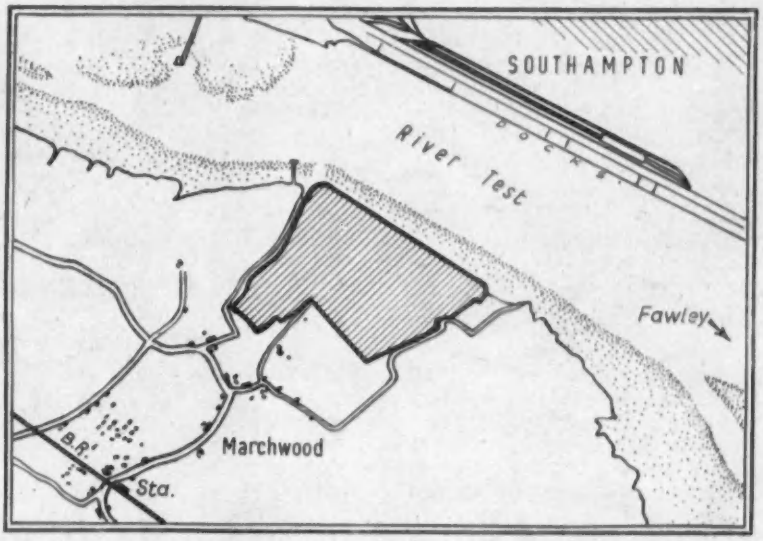


Fig. 3. Plan view of the Marchwood site to show initial relationship to road, rail, and river access

Access

An ideal site is bounded on one side by a road, on another by a railway, and on a third by a navigable river. This combination can rarely be achieved. Access requirements have nevertheless to be met. A road is vital in the constructional period for the conveyance of raw material and equipment to site and, as much major equipment is now transported by road, loadings of up to and possibly over 100 tons on a single vehicle must be considered. Coal can come in by various means—road, rail or water borne—and adequate means for storage and handling must be provided. A 240 MW station, for example, operating at 40% load factor, consumes about 350,000 tons per annum and facilities for the supply of this quantity must be investigated.

Although water and coal are among the most important features in evaluating the possibilities of a site there are other points to be considered. Ash disposal on site is a most desirable attribute as this is invariably cheaper. However, in some cases it is possible to dump it into local quarries, borrow pits or to use it for land reclamation without involving excessive cost. Disposal by dumping at sea, or at long distances, is expensive in transport charges.

The connection between the site and the existing transmission system, usually by overhead line, may sometimes prove a source of objection on amenity grounds, and the shorter it is the less is the probability of trouble.

Large quantities of fresh water are needed, for building the station, for commissioning the plant and for boiler make-up and domestic purposes, and although a supply is generally available from the local water undertaking, the possibility of having to sink artesian wells may arise. Looking even further ahead, the labour and the housing situation of the district can be surveyed but as site investigation usually takes place at least eight or nine years ahead of commissioning the results are necessarily somewhat indeterminate.

Aerodromes

Airfields provide a special problem due to the importance of safety and the reduction of flying hazards, and the Local Planning Authority, under para. 2 of the Town and Country Planning (Air Fields) Direction of 1949 is required to consult with the Air Ministry in relation to any application made to them for the development of (*a*) land within a two mile radius circle, and within the take-off funnels of airfields up to a three mile radius circle. (This applies to buildings, structures, erection and works exceeding 50 ft in height), and (*b*) Land between the two and three mile radius circles, not occupied by take-off funnels, of buildings, structures, erections and works exceeding 150 ft in height.

Although the responsibility lies with the Local Planning Authority, the B.E.A. generally consults the Air Ministry

Fig. 4. Here further development is in hand at the north-east corner of the site. The initial piling work has begun. This photograph is taken from a much lower altitude than Fig. 2

directly. In many divisions a large amount of land is covered by these restrictions, and as both airfield and power station requirements are directed towards flat, good load-bearing and cheap land it is often found that preferable sites lie within the areas prohibited under this direction.

Further Considerations

There are of course outside interests which have to be considered. In areas where mineral extraction is taking, or has taken, place it is important to ensure that such workings will not lead to subsidence on the site area, and it may be necessary to locate sites so that they do not sterilise large areas beneath which unworked mineral deposits lie, and which may need extraction in the future. The effect on fishing and other interests of river and in estuary users and the possible results on water supplies if underground sources of water are to be tapped are other points which arise.

Finally there is the effect of the completed station on town and country planning and land utilisation. Amenities provide the most intangible of all the factors involved in site selection, but are often the cause of the greatest controversy, and most diligent and careful enquiry is required. Buildings of historical and architectural merit in the vicinity of the site are considered, and effects on the scenery and general pleasantness of the surrounding countryside are estimated, not only as far as the power station and its ancilliary buildings are concerned but also from the aspect of the transmission system.

The Marchwood Site

It may at this point be instructive to see how Marchwood fits into the general picture of site requirement. Being on the bank of Southampton Water, ample circulating water supplies are naturally available, and a deep channel capable of taking the largest colliers is adjacent to the site. Colliers can consequently dock at most states of the tide. The land concerned consists of inferior pasturage with, on the seaward side, an extensive area of saltings. Thus the actual value of land, which was owned by farmers, was not particularly high. Although near the New Forest, no part of the site is within the boundaries of the protected area, a consideration which ruled out several other possible sites in the immediate vicinity. At this point of Southampton Water, the tidal variation is comparatively small, the mean variation between spring high and low tides being 13·25 ft with a maximum recorded difference of 19·42 ft. Consequently capital charges for civil engineering work on the pump house and ancillary work are much less than would be necessary with say 30 to 40 ft tidal range.

The subsoil, consisting of Bracklesham beds overlaid with gravel, while providing hard driving in the greensand is well suited to bear the weight of the station. Access via the Southampton-Fawley road is reasonably good, and although rail access was not originally present, by the good offices of the Port Transport Section of the Royal Engineers who had a depot in the vicinity, a section of their own railway system has been extended to the site and connection made with the Southern Region Southampton-Fawley line. The site is also outside the prescribed areas imposed by airfields regulations.

Although possessing these considerable advantages the site itself is a drainage area into which water flowed from the inland areas, and arrangements had to be made for this water to be channelled off into Southampton Water prior to making up the ground.

Selection of Set Size

The decision as to the number and sizes of sets to be installed in any projected power station or extension is made by headquarters, and is determined largely by the type of duty which the sets will have to perform and also by the extent of the development that can be supported on a particular site. The economic factors remain a major consideration in the light of the importance of reducing capital and running costs.

For any given capacity there can of course be a large selection of set sizes and number of sets. A 240 MW station could for example consist of 8 x 30 MW, 4 x 60 MW or 2 x 120 MW. However, from the viewpoint of capital cost, a 120 MW set is considerably cheaper than two 60 MW sets. It would thus seem logical that all new sets should be of the largest size and such indeed is the broad trend. There are however cases where the anticipated type of operation envisaged does not permit installation of the largest machines and here smaller sizes are more appropriate. Further, where extensions to existing stations are contemplated space considerations alone may rule out machines of over a certain size.

Rationalisation of set sizes is of benefit both to the manufacturer and to the purchaser, and also eases the problem of selection. The first important step toward this was the issue in 1947 of a Statutory Instrument laying down two standard set sizes of 30 and 60 MW together with their associated steam conditions. With the establishment of the British Electricity Authority, however, the necessity for this instrument vanished and it was rescinded. In 1950/51 proposals were in hand for 100 MW machines operating with unit boilers at 1,500 lb/sq in. 1050° F. Now 120 MW reheat machines are in hand with conditions

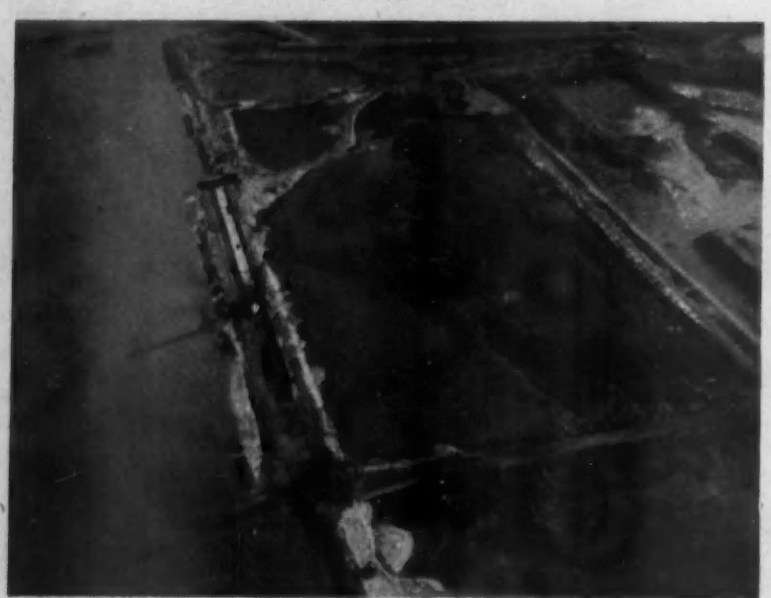


Fig. 5. Development at the south end of the Marchwood site showing reclamation of the foreshore

Fig. 6. The piling for the power station is advancing. In the foreground can be seen the circular construction adopted for the pump-house.

of 1,500 lb/sq in. at 1050° F and these are to be followed by 200 MW units with pressures of 2,350 lb/sq in. 1050° F and reheat to 1000° F.

While such standardisation is most desirable, it cannot always be applied with rigidity, as influences outside the control of the B.E.A. can play a significant part. As an example of this, the outbreak of the Korean war, resulted in a shortage of rare metals used in the production of alloy steels for high pressure and high temperature working and in consequence in one case lower temperatures were accepted. Long term planning at present is based largely on the use of 120 MW machines where two-shift working is contemplated, with 200 MW sets taking the base load. Single shift working is confined mainly to existing plant.

The establishment at headquarters of set sizes takes place in advance of the inclusion of a project in the provisional programme, although modifications may be made to the number of units subsequently.

Authority to Proceed

In the headquarters procedure described in our previous article we terminated with the issue of the letter of authority to proceed. This letter, which is sent to the Divisional Controller concerned, attaches the station development particulars giving all the information relevant to the site and stating the size of sets, steam conditions, ultimate size of station and other pertinent data. It also contains broad instructions as to tendering. In the past, tenders for boilers and turbines have been allocated to specific firms with the object of spreading the load evenly over the manufacturing capacity of the country. For the 1959 programme, competitive open tenders are being adopted on a wide scale.

This letter, which, to the Division, marks the beginning of the main work in connection with the power station, is issued as soon as possible after the project is included in a provisional programme. Divisions in collaboration with headquarters proceed with detail design work and the preparation of specifications so that sufficient information is available to fulfil the requirements for the application to the Minister, and the broad outline of the project is also formulated. Plant and civil design work proceeds during the period in which the application is under consideration so that the first contractor can start work on site as soon as consent is given.

Consent

Consent of the Minister of Fuel and Power is necessary for the establishment or extension of a power station, under Section 2 of the Electric Lighting Act 1909, as amended by the Electricity Act 1947. Under Section 35 of the Town and Country Planning Act, 1947, the Minister's consent also embodies Deemed Planning Permission for the proposed development. The procedure for Section 2 Consent and Deemed Planning Permission is thus a joint one and both aspects must be considered together. This concern is the major hurdle to be surmounted in the evolution of the project.

The procedure, in the application for a new power station, is that the Authority shall give notice of their intention in the London Gazette and in appropriate local newspapers; make available for public inspection plans and drawings of the proposed station or extensions and give notice to owners and occupiers of land situated within three hundred yards of the site and to the local authority for the area so as to afford an opportunity of stating objections.

The public notice usually allows a period of 30 days for the lodging of objections and at the end of that time the Authority is in a position to appraise the nature, extent and weight of any opposition. This may not be confined to those people on whom notices have been served as the Ministry is also prepared to consider objections from national or local organisations and from individuals outside the 300 yard boundary. Arrangements may be made to see or write to objectors should there be any likelihood of allaying their fears or otherwise satisfying them, the

Ministry being advised of such action. Finally the Minister either grants consent, subject to such conditions as he thinks fit, including those imposed by the Local Planning Authority, or alternatively proceeds to hold a local inquiry before coming to a decision. There is no statutory time limit upon the deliberations of the Minister or the Local Planning Authority.

Should it be decided to hold an inquiry the Ministry normally consults the Authority about a suitable date and asks for the necessary arrangements to be made and the giving of public notice.

The procedure of such an inquiry is that the Authority must state its case and put forward witnesses to give expert evidence in its favour, each witness being subject to cross-examination by opponents of the scheme. The objectors then state their cases for the opposition and may, should they choose, also put forward expert witnesses who in turn can be subjected to cross-examination. The range of subjects that may be probed is not prescribed in any way and experience has shown that cross-examination may be allowed by the Ministry's inspector on any detail of the proposed development, on practices and developments at other power stations and on a wide range of matters of generation technique and policy. Preparation for an inquiry consequently entails the assembly and presentation of a great volume of technical information. In the event of consent being withheld the project must be abandoned.

Land purchase has been proceeding along with the Section 2 Application. Generally the land is purchased by agreement, its price usually being small in comparison with the cost of the power station to be erected on it. In the event of the owners being unwilling to sell it is possible as a last resort to obtain a compulsory purchase order and this is usually dealt with at the same time as the inquiry.

During this period also the executive architect has been evolving his detailed designs so that they can be put before the Fine Arts Commission for comment. In addition the main site work has been planned and the site clearance contractors are ready to go into operation. The whole aim in preliminary work progressing is to ensure that constructional work can begin as soon as consent is obtained.

In the next article in this series it is proposed to investigate more closely the procedure for tendering, the co-ordination between the Authority and manufacturers, and progressing.

(We have been asked to point out that the Technical Developments and Contracts Committee mentioned in our last article is a full Committee of the B.E.A. and is not attended only by chief officers.)

Prospects for the Printed Circuit

THE printed circuit has been known for many years, but has not yet attained in Great Britain the widespread use forecast for it in many radio, television and other fields. Yet in mass production, particularly in production for armaments, substantial savings in labour, cost and time can be made. This is emphasised by Dr P. Eisler, of Technograph Printed Circuits, in a recent monograph. The use of dip soldering techniques whereby large numbers of joints can be made in a single operation has been a critical factor in the adoption of printed circuits for mass produced television and radio sets in the United States where labour costs are particularly high, and made for the acceptance of the technique in its simplest form. The really basic idea of redesigning equipment in order to make feasible production of the major part of it by a printer or an automatic machine has not yet been fully appreciated.

The second most prominent economy resulting from the use of printed circuits is the consequent reduction in materials and size of construction. The saving of weight and space achieved by miniaturisation, while of general importance, is particularly critical in aircraft, where any weight saved is equal to an equivalent weight of payload, estimated at about £200 per lb weight.

The weight and space saving accrues in three main ways (*a*) the replacement of volume elements by surface elements: wave guides for micro-waves can be produced as printed strips. (*b*) complex wiring patterns can be produced which are much more compact than their conventional equivalents, and (*c*) heat dissipation is much better, so that a foil conductor can carry a much heavier current than a wire of the same cross-section and specific resistivity. With folded circuits such items as chokes or transformers may be assembled. The monograph gave curves comparing the performance of printed circuits with equivalent wire circuits.

In addition to wiring functions, printed circuits can be used for heating functions such as de-icing of various parts of the airframe, engines, propellors or special equipment and instruments by printed circuit heating mats.

For the electrical industry generally, the main economic factor is generally to reduce the cost of materials used, in contrast with labour costs in electronics, and weight and space saving in aircraft. Industrial applications of surface heating in many fields are under development, and looking still further ahead, one can envisage electrical machines (transformers, chokes, motors and generators) which will use printed circuits both for their electrical and magnetic circuits and for their control gear.

It is possible to show that by designing the stators and stator connections of Strowger type two-motion switches for printed circuit construction the size can be reduced to a small fraction of the conventional type. Such switches are used in very large numbers in automatic telephone exchanges, and the use of printed circuits would offer tremendous advantages throughout the telephone industry reducing initial cost and subsequent maintenance and even leading to substantial savings in building requirements.

In the computor field, the complexity of the wiring circuits is continuously growing and here the printed circuit, which can be made to a high degree of complexity, has a most pertinent part to play, besides possessing a high degree of reliability.

In conclusion, Dr Eisler emphasises the slowness of development of printed circuits subsequent to the war, which he blames largely on the necessity for a complete mental re-orientation on the part of an already much harassed designer. Secondly, he mentions the pioneering organisations, which are small and comparatively weak, and lastly the lack of enthusiasm on the part of manufacturers of radio components or telephonic equipment who do not feel inclined to collaborate with printers who may one day put them out a profitable part of their business by printing those very components as integral parts of the circuits.

The Batti-Wallahs' Ladies' Night

Members and guests at the Batti-Wallahs' Ladies Night: (1) The President, Mr C. N. Good, greets Sir John Hacking. (2) Mr and Mrs W. Webb and Mr and Mrs N. V. Castling. (3) Mr and Mrs Forbes Jackson are received. (4) Mr and Mrs H. Bishop. (5) Mr and Mrs F. J. Lane. (6) Mr and Mrs C. B. Cleland. (7) The President and Mrs C. N. Good. (8) Mr T. C. F. Bigland, Mr and Mrs H. W. Wallis. (9) Mr and Mrs A. H. Hughes. (10) Mr and Mrs P. J. Squire. (11) Mr and Mrs W. N. C. Clinch. (12) Rear-Admiral Sir Philip Clarke and Mrs R. L. Alexander. (13) Mr G. H. L. Smith with Mr and Mrs W. H. McFadzean. (14) Rear-Admiral Sir Philip and Lady Clarke, with Mr and Mrs A. N. East

Behaviour of Control Systems

Transient Response of Servomechanisms and Phenomenon of Sub-harmonic Generation in Feedback Loops

DEVELOPMENT of closed loop control systems involves, in many cases, regulation of the response to obtain the desired characteristics when the system is supplied with a transient input. Such was the case in one of two papers presented last week to the I.E.E. Measurements Section, both papers being concerned with the behaviour of closed loop control systems. The paper, by J. C. West, B.SC., PH.D., A.M.I.E.E., and P. N. Nikiforuk, B.SC., considered remote position control systems having a non-linear characteristic in the loop. Although, in non-linear feedback systems, non-linearity is usually undesirable, the type of amplitude non-linearity considered here, giving a "hard-spring" characteristic, has a useful feature since the characteristic reduces the time in which the system responds to an input signal. Moreover, the step response time continues to decrease with increasing step amplitude.

Cubic Characteristic

The non-linear characteristic takes a cubic form, and it is of interest to note that it is thought that the tensioning of muscle in animals (and man) follows a cubic relationship with the stimulating signal. Two types of second order system are considered, one having an amplitude characteristic as a smooth curve, the other having a characteristic which comprises segments of three straight lines. Work was carried out on the system using velocity feedback stabilisation, but since this form of stabilisation produces a velocity-lag the use of derivative-of-error stabilisation (which eliminates this lag) was also considered. Since the response of non-linear servomechanisms is amplitude dependent, the input amplitude must be regarded as a parameter of the system, the other parameters being the degree of non-linearity and the degree of damping. The latter, to be independent of the other two parameters, refers to the equivalent linear system obtained when the non-linear element is removed and replaced by an equivalent linear element.

Much of the paper is given over to mathematical considerations of both types of servomechanism, giving an analysis of the straight-line segmented system. An experimental system, using this type of system, was set to obtain verification of the analysis and results show that, under certain conditions, the transient response of the non-linear simulator is better than that of the equivalent linear system. The effect of using derivative-of-error stabilisation to produce phase-advancing, was discussed, and compared, experimentally, with a similar non-linear system using velocity feedback.

Sub-Harmonic Generation

Associated with the above paper was the second paper presented at the meeting, which considered the mechanism by which frequencies lower than that of the input signal, can be generated in a feedback control system. Read by J. C. West and J. L. Douce, M.SC., GRAD.I.E.E., the paper was again concerned with non-linear servomechanisms but in this case, due to the input signal modifying the response of the non-linear element, a further signal is produced, having a frequency considerably less than that of the input. In all cases, the lowest frequency present in the output is a sub-multiple of the input frequency, and is usually at or near the natural frequency of oscillation, and for this reason the phenomenon is known as sub-harmonic generation.

Because the generation is resonant in nature, the sub-harmonic content is often of large amplitude, thus considerably altering the output from that normally obtained, and giving rise to considerable distortion. For this reason, it is important to impose conditions on the parameters of the system to ensure the absence of the phenomenon. Since it does not occur in linear systems, it must therefore depend on the non-linear characteristic involved in the system. However, it may not be possible or convenient in a practical system, to modify the form of the non-linear element, thus showing the importance of determining the most suitable method of modifying the linear element in a feedback system to ensure that sub-harmonic generation is eliminated. Previous work has accounted for sub-harmonic resonance by the solution of a non-linear differential equation, in which the non-linear characteristic is expressed as a power series. However, this method is inapplicable to many systems where sharp changes of slope—resulting, perhaps, from saturation—occur. An experimental arrangement comprising a linear element, together with a suitable non-linear element of hard-spring characteristic, was set up in a feedback loop. Results agreed with mathematical analysis of the system and enable criteria of the conditions for preventing the oscillations to be developed.

DISCUSSION

PROFESSOR A. TUSTIN (University of Birmingham) said he wondered why there was such interest in the response of step-functions. He had never been able to see why that kind of solution, apart from its theoretical interest, should engage so much time of so many people. No servo worked that way except, of course, under running-in conditions. One might well ask what was the use of a detailed inquiry into step-function response systems so far as servo design was concerned, apart from providing exercises for students in advanced mathematics. Having now acquired so much experience in applying phase-plane methods and other methods to non-linear problems it would be interesting to have some indication of the direction in which it was felt further research in that field would be fruitful.

MR D. V. BLAKE (N.P.L.) referred to the use of the phrase "better response" and pointed out that a fast response was not necessarily a better one. On the question of checking, there seemed at the present time to be a lack of adequate means of checking simulator solutions. In linear systems it could be said to be reasonable and the response did fairly well what one would expect, but in non-linear systems it was very difficult.

MR J. J. THOMPSON said that the company with which he was associated had used non-linear damping of the segmented line pattern in hydraulically operated steam turbine governors for the past twenty-five years for the express purpose which the authors mentioned, namely, of decreasing response time whilst maintaining stability. He protested strongly against the continued use of the jargon term "hard spring." If electrical engineers must use mechanical terms they should study accuracy. Hardness was by definition the ability to resist indentation. The hardness of a spring had, therefore, no effect on the characteristics of a spring as such but rather on its fatigue limit.

Electricity in Finland

THE 10th CAROLINE HASLETT TRUST LECTURE

IN the autumn of 1954, Miss M. J. Cumming, Senior Demonstrator of the Clyde sub-area of the South-West Scotland Electricity Board spent some time in Finland studying aspects of domestic electrification. Her findings and comments formed the substance of the 10th Caroline Haslett Trust lecture, given at the Institution of Electrical Engineers on Tuesday.

She began by giving a general picture of the electricity supply industry in Finland. Although the country is a land of lakes, it does not possess an abundant supply of hydro-power, mainly due to the small rainfall, low elevation and fluctuating water flows. These physical difficulties have in some cases been overcome by engineering skill, but at considerable cost.

Generation

In 1945, Finland's electricity production dropped by one-third due to the loss of the largest generating station in the ceded territory of the Karelia. In spite of immense difficulties, and in face of a devaluation of currency, the electricity authorities developed plans for the building of hydro-stations in the north-west of the country. To permit the necessary capital to be raised, new companies in which the State is an active member were established. The Oulu River Co., is jointly owned by the State and private companies, as is also the Kemi River Co.: Imatro Voima Oy, is entirely State owned.

The transmission lines feeding the south are long, anything from 300-500 miles, and construction can only be undertaken in summer. The high voltage transmission lines operate at 220 kV with 110 kV as a second voltage. For distribution purposes it is stepped down to 20 kV, and for rural areas, from 20 kV to 380/220 mains. In Helsinki an intermediate voltage of 5 kV is used in addition. Today 86% of power is water generated and 14% generated by steam, coal being imported from Poland, India and Great Britain. The use of atomic power is incidentally prevented under the terms of the peace treaty.

Before the war only 50% of the farms and country dwellings were electrified; post-war plans for further electrification of the rural areas had to be designed because of the shortage of paraffin for lighting purposes, and to avoid migration from the country areas to the towns. Several new companies were formed to speed up this electrification and it is hoped that 80% of all rural dwellings will be connected by the end of this year.

Electricity benefits the farmer's wife in many ways; light brings comfort to the home; radio destroys the isolation; and the electrically driven pump brings up the water from the lakes. The electric cooker is widely used to supplement the older timber cookers, and on the larger farms, electric milking machines may be installed. Poultry rearing is simplified and aided by electrically operated incubators, and hen-house lighting.

Safety

An Electrical Inspectorate, was formed some 25 years ago. It is responsible to a Board of Directors where State and private enterprise are equally represented. The State is represented by the Ministry of Industry and private enterprise by the privately owned electricity companies, Finnish industry and fire insurance companies. By law, all electrical installations, power plans, overhead lines, indoor installations and appliances must be constructed so that they do not cause danger, fire or loss of life. The Ministry of Industry has power to make technical regulations, although the issue of them and the testing and inspection functions come under the Inspectorate.

The accent is on safety, and testing is compulsory although not absolutely enforced. Appliances not approved by the Inspectorate may be sold, but they will not be connected to the supply. Manufacturers pay yearly fees to the Inspectorate which vary according to the contract between the manufacturer and the Inspectorate, but in addition separate fees (£3. 4s.) are payable for the approval test. Thus all appliances carry a small security tax which is the consumer's share of the payment for the safety test. Appliances from Britain must also be approved by the Inspectorate before being accepted for the Finnish market.

Meters and Tariffs

After dealing with typical arrangements of flat installations, Miss Cumming mentioned the difficulty of payment in a country with an unstable economy. Special coins are used for prepayment meters, and thirteen of these can be purchased at a time from the milk shops—milk is not delivered daily. One of these coins buys two units of electricity and two or three coins may be inserted at the same time. The coin box, however, must be emptied after thirteen coins are inserted which is possibly the reason why the ordinary meter is preferred by 90% of consumers. The normal meter has a current rating of 10 amp.

Consumers have a choice of (*a*) a small meter charge per year plus a charge for every unit and (*b*) a fixed yearly charge based on every room plus one room plus a charge for every unit consumed. To prevent further inflation, tariffs have now been stabilised by government instruction.

Space heating by electricity is not encouraged and tariffs have been designed specially to make it almost impossible. The same applies to water heating, but most homes are already centrally heated.

Cookers are also affected by the prevailing shortage of power, and a type now being manufactured in Finland has a loading of 2·75 kW and has in addition a selector switching device employed to restrict total consumption. This model is used extensively in city homes, and in combination with the timber cooker in the country kitchen.

Owing to the cold winters, there is a tendency for water pipes to freeze and electricity is largely used for defreezing by low voltage heavy current. The regulations insist that the operator of the de-freezing transformer must be a qualified electrician, due to the possibility of fire and the necessity for restricting the current. Design of washing machines is somewhat influenced by the climatic conditions for in the clean air clothes do not get rapidly dirty. In the cities, each block of flats usually has its own communal laundry, where a centrifugal type Finnish machine taking 15 lb, is generally installed. Smaller types are available for use in private dwelling houses.

The lecture concluded with a review of other domestic appliances including electric irons, vacuum cleaners, floor polishers, refrigerators—for which there is a considerable demand—grillers, coffee kettles, portable cookers, and lighting. Finally, comments were made on publicity methods, selling, and electrical education.

wiring at the exhibition

by Megohm

IN company with many other engineers I toured Earls Court on several occasions last week. I did not calculate the number of walking miles involved in these visits nor did I keep count of the friends I saw on the stands, but the amount of information gleaned proved the worth of this undertaking. All praise must be given to the organisers and exhibitors for providing such a fine shop window for the electrical industry. Conversations with the representatives on the various stands showed that many of the visitors this year were architects, who showed great interest in the many exhibits. It was pleasing to note that many young people were present in the afternoons which, to me, meant that employers were encouraging their apprentices to visit the show. They no doubt asked many questions and, I feel certain, these were answered in the same pleasant, interested manner as my questions were.

One question which I kept asking myself during the run of the exhibition was how to describe the many interesting things on view. Naturally, I cannot mention every manufacturer's goods in the space allotted to me and, therefore, I have kept to the goods which I consider are of most interest to those who are engaged in the contracting industry.

Switchgear and Fuseboards

Messrs Simplex some time ago introduced their "Regent" range of switches, switchfuses and busbar chambers, and this year presented their fuseboards to match. These boards are pleasing in design having a smooth, modern styling and with concealed hinges permitting flush or surface mounting. Certain sizes are fitted with double cover lids to reduce the projection when opened, and the hinges permit 120 degree opening. In order to maintain the clean lines of this range of boards, interior fixing holes are provided and each hole is equipped with a bush to cater for any irregularities of the mounting surface. The fuse banks are held in position by slotted nuts to studs and will remain in position with the nuts removed, thus leaving both hands free.

In the 15 amp 16-, 20- and 24-way sizes, the main terminals are grouped together in the centre section of the fuseboard, thus making the connection of large main cables much easier, and the fact that the terminals can swivel through 360 degrees makes the positioning of the cables a simple matter. The cables suffer less damage through being able to leave wide sweeps in them rather than bending the cable to suit the clamps. Provision is made for earthing as necessary, also for securing a standard ivorine label size 2½ in. x 1 in. on the cover of each board. In conclusion, a neat, pleasant-to-look-at board with a great deal of consideration for the installer.

Messrs Astral Switchgear exhibited for the first time their l.t. fuse switchgear, and this gear also has much to commend it. The test records were available for inspection as were the actual contacts used in the tests. To provide easy access to the fixed contacts, the whole mechanism, moving contacts and fuses can be hinged outwards by the removal of a single screw. These switches are designed for the use of h.r.c. fuses to B.S. 88: 1952 Category 4. Switches are fully interlocked against incorrect operation and provision is made for padlocking the centrally disposed operating handle in either the open or the closed position. Two styles of this gear are available: the Unit type meets the demand for floor or wall mounting switch panels, whilst the Flush type is for sheet steel cubicle flush-front panels. Special sealing boxes for p.i.l.c. and a. cables are available, fitted with either brass wiping glands or clamp type terminations, and brass glands with armour clamps are also available where wiped joints are desired.

I examined with interest the various contactors and starters on Messrs Arrow Electric Switches' stand and, in particular, the small panel-mounting contactor which I mentioned in my last Notes. The other contactors on view were neat in appearance and the catalogue issued by this firm is extremely useful and enlightening.

Trunking

Trunking was displayed on numerous stands and in various forms. Particularly interesting was the new "over-floor" trunking with the very suitable trade name of "Pancake" trunking. This is a new product of Messrs Channel Conduits Ltd. and should prove useful in existing office buildings where services are required to be run to desk positions. This trunking consists of a rectangular steel duct 1 in. wide by ½ in. deep in which the wiring is laid. The capping is made of tough hardened rubber and it incorporates a steel re-enforcing strip so that the wiring is completely boxed with steel. The capping is stuck to the floor by means of an adhesive compound which is supplied and this renders the ducting dust- and water-proof. One of the patent solvents can be used to remove the adhesive and, of course, the ducting is reclaimable and alterations can be made quite easily. Steel fillets can be supplied in order that other service wiring can be laid in the same duct as lighting and power cables. There are various types of boxes and outlets available. I found that it was reasonably easy to walk about in the area where the trunking was laid without catching my foot on the trunking. The natural upward curve of the foot assists greatly in this. Altogether this is an ideal system for an awkward job.

An impressive array of busbar and cable trunking and rising main systems were on show on Stand 215. The Power Centre Co., Ltd., are well known in this field of the industry. One feature on this stand was the multiway metalclad fuseboards designed to match up their cable trunking and busbar systems. A miniature pattern busbar trunking incorporating all-insulated busbars and tap-off points at two feet centres drew an interested crowd.

Messrs Marryat and Place Ltd. had on view the space-saving Barduct which measures 5½ in. wide by 1¾ in. deep for either the 150 or 250 amp 4-pole size. Tap off boxes, available in 20, 30, 60 and 100 amp sizes, can be fitted at 18 in. intervals.

Earthing and Accessories

Again Porter Electrical Products Ltd. had their patent earth continuity system on show. An addition to their range was the "Fulgrip" clamp assembly for bonding large diameter pipes or round ducts. This assembly has been prepared for use in oil refineries, etc. The Portaway "Dryrod" electrode has vast possibilities and I shall be interested to see if any mention is made of this electrode in any future Code of Practice for Earthing.

Accessories were, to say the least, extremely well represented. Messrs M.K. Ltd. had an extensive display including their already well-known products. Their plateswitch range is now available for plaster-depth boxes, both metal and wood boxes are available. Two metal and two wood screws are supplied with each switch, a feature which should be greatly appreciated by the man on the job. All too often time is wasted in searching for the correct fixing screws. The design of the plateswitch met with praise from architects who were present during one of my visits to the stand. A new line by this firm is the "Gridswitch" which can be obtained in protected or non-protected dollies. In the brassplate range the switches are available in one- to eight-gang and in the insulated plate range in one- to four-gang. This range is for flush work and the principle is simple yet extremely effective. Interchangeable components for easy stocking and versatility are readily available and the switches are supplied ready-assembled on grids of one, two, three, or four switches. A similar range of switches is made for surface work. One-way and two-way switches are available and an intermediate switch interchangeable with these is now under development.

The "Wylex" range of switches included the small t.p. isolator for motor control which I mentioned in my last Notes. One switch which did attract my attention was the 20-amp pilot switch with the small neon light indicator. A most useful switch indeed and very reasonable in price. It retails at approximately 14s. complete with pattress and embossed "Water Heater." An earthing terminal is provided. A very useful switch for the contractor in the country.

I particularly liked the new "Little Briton" accessories on Messrs Britmac's stand, and the "squirrel grey" finish should appeal to the modern housewife. It is clean looking and should be most useful to architects who specialise in interior decoration. Very often their complaint is that the normal colours of the switchplates do not lend themselves to contrast in decorations.

Messrs Tucker and Co. were again displaying their "specials" or purpose-made assemblies for individual requirements. New products on view included 5 and 15 amp resilient moulded plugs and 15 amp ironclad protected surface switch assemblies. I spent some time here admiring, and appreciating, the results of expert craftsmanship and the high class finish on the accessories.

Mobile X-ray plants in hospitals have on many occasions caused damage to switchsockets and Messrs Wandsworth have now developed a mercury sparkless control unit of 30 amp capacity to assist in this matter. This manufacturer had switchplates in many colours to offer their clients. The "Wemlock" range of cylinder lock switches were again to be seen.

For those engaged on installations which demand flameproof gear, I feel sure that the miniature 5 amp switch on Messrs Walsall Conduit Ltd.'s stand must have been of immense interest. Literature dealing with this switch will be available soon.

When I examined the products of the stand of Messrs Ashley Accessories Ltd., I was more than pleased to note that all their 13 amp ring-circuit accessories carried in their packets a data sheet. This sheet had illustrations of some arrangements which comply with the I.E.E. Regulations for installations where a diversity factor may be applied. I was informed that many requests had been received from their clients for further copies of this sheet. This firm has introduced a 13 amp socket twin adaptor, shuttered and fused. If adaptors *must* be used on this type of installation then I strongly recommend this one. The fuse is quickly changed and yet cannot be easily tampered with by children. Another feature of these accessories is their new porcelain base 13 amp socket. For the contractor engaged on housing installations in t.r.s. there is a very robust 30 amp rated spur box for use on ring circuits. The terminals are substantial and the patent indexed cover has integral shutters which close up unused entries. A really useful range of products, well made, and should prove of great interest to the contractor who has a demand for 13 amp accessories.

Cables

When I called on Messrs Pyrotenax Ltd.'s stand I received a reprint of my "Notes on Wiring" dated 30th December, 1954. On the back of these Notes there was an invitation to visit one of the six showrooms of this firm for a demonstration. I casually enquired if many people accepted this invitation and was informed that in London they had done so, but in the provinces the contractors were not so inclined. This rather amazed me, for I have always felt that the provincial contractor was always keen to learn and to take advantage of facilities which his London counterpart had already on his doorstep.

I saw the new hand crimping and compression tool which has been developed to simplify the operation previously carried out with the screw type expendable tool. The new tool costs 21s. I saw photographs of yet another use for this type of cable. Four single-core cables are run at high level in a factory with connector boxes installed at set intervals with controlling switchfuses connected at these points, the whole arrangement forming a type of overhead busbar system. It is claimed that costs are reduced with this arrangement. No doubt many people will argue that this arrangement does not provide the flexibility that a normal o/h busbar does, but I had that point answered in quick time and the answer was perfectly feasible.

Circuit-Breakers

I listened with great interest to the representative on Messrs Chilton Ltd.'s stand who was demonstrating circuit-breakers. Who better to discuss and expound the features of this firm's products? On show were miniature c.b.s and the "Chilton" voltage operated e.l.c.b. which are suitable both for domestic and industrial applications. An amusing sidelight to this display was the well-known electrical engineer having a practical demonstration of their "short, back and sides" equipment.

Messrs M.C.B. (Manchester) Ltd. had a new range of "Lupus" m.c.b.s of greatly simplified design, and intended essentially for distribution work. These breakers have some worthy features such as reduced size, magnetically assisted thermal protection unit, arc tips integral with the main contacts and a completely sealed mechanism.

In conclusion I enjoyed every moment of my visits to the Exhibition, and I hope that these Notes refresh the memories of those who went there, and have been of some service to those who could not attend. Next year I would like to see the exhibitors attempt something new in the way of designs of their stands.

First Profit By Uganda Board

AN increase of approximately 25% in units sold was recorded by the Uganda Electricity Board in the year ended 31st December last. In all, over 63·6 million units were sold, of which industrial power accounted for 30·4 millions. Consumers on the domestic "all-in" tariff took 21·3 million units. For the first time since the Board's inception, a net profit (£33,917) resulted from the year's working after charging sinking fund and interest on assets employed in earning revenue. It is evident that the operation of the Owen Falls hydro-electric project, last April, since when the four thermal stations have only been run in an emergency or to facilitate certain transmission line maintenance work, is responsible for the healthy improvement in the Board's financial structure. Furthermore, it has resulted in a reduction in tariffs as from last January.

Two 15 MW sets were in operation at Owen Falls at the end of December, and a third machine is due for commissioning early this year. Estimates of future load development have necessitated the placing of provisional orders for sets Nos. 7 and 8 and the embedded parts for the remaining two machines to complete the installation of the station to turbine room floor level. It is foreseen that this station may well be unable to meet the growing power demand during the next decade and instructions have been given for a survey to be carried out of hydro-electric potential of the Nile downstream from Owen Falls.

The Board has also considered the question of supplying electricity to areas of Uganda which are outside the range of economic transmission from Owen Falls. This would involve the installation of new thermal plant as that in the Board's present thermal stations is too large and unsuitable for the purpose. At the moment, load surveys of up-country areas are being made in order that the Board may further consider the economics of such schemes.

The 132 kV line from Kampala to Tororo is now in operation, and the Board have approved the extension of the transmission system to Masaka, 85 miles south-west of Kampala. Negotiations have continued concerning the proposal for a bulk supply from Owen Falls to Nairobi, and it is hoped that agreement will soon be reached. Final orders were placed last year for switchgear and equipment to be installed at Owen Falls, Kampala North and Tororo 132 kV substations.

It is expected that a contract will shortly be placed for the construction of a new head office building in Kampala for the Board and three other commercial organisations. The building should be completed in three years.

The report, which is illustrated with many photographs taken at the opening of the Owen Falls station by H.M. the Queen, refers to the year under review as seeing the fulfilment of the expectations of many who for the past seven years had laboured in the creation of the hydro-electric scheme.

SOUTH WALES BOARD PROMOTES ELECTRONICS

IN order to stimulate industrial and commercial interest in the electronics industry, the South Wales Electricity Board recently held two-day conferences at Swansea and Cardiff. Industrialists, E.C.A. members and various teaching organisations were invited and in addition to hearing a talk and discussion on "Electronics in Industry and Commerce" saw an exhibition which was staged by the Board in conjunction with leading manufacturers.

In his talk Mr W. P. Warren, B.SC., A.M.I.E.E., dealt briefly with the fundamentals of thermionic valves, photo-electric cells, transistors and magnetic amplifiers, and then led on to a survey of their industrial applications. Using pictorial examples he stressed the economies obtained in each case. Turning to the "specialist" aspect of the problem he stated that the question of training maintenance personnel would have to be faced squarely by industrialists. It was debatable whether the emphasis should be on engineers with power experience and some knowledge of electronics, or alternatively, "radio mechanics," with training in power engineering. Mr. Warren then laid stress on the relationship between the Board and the Industry, suggesting that a "buffer" service be provided whereby specialist advice could be made available to industrialists because of close liaison with manufacturers. Whilst the Board's staff were not themselves specialists in electronics, they would be able to forward enquiries to the appropriate manufacturers. In conclusion, Mr Warren gave results of researches he had made in conjunction with users of electronic equipment. From this evidence it was clear that users were satisfied in respect of capital cost and its recovery, economies effected, robustness of equipment and comparatively low maintenance costs.

During the discussion period following his talk, Mr Warren assumed the chairmanship of a "Brains Trust" composed of representatives of four manufacturers exhibiting at the conference.

Mr V. J. Trenchard of Elliott Bros., demonstrates an application of their load cells

The colour sorting exhibition by Lancashire Dynamo Electronics was a great attraction

English Electric Co.'s 5 kW induction heater was demonstrated by their Mr Robertson

SPEEDING TRAFFIC

Automatic signalling at Monument Inaugurated by Lord Mayor

ONE of the last major junctions in the City of London went over to automatic control when the "Electromatic" vehicle actuated traffic signals at Monument were switched on last week by the Lord Mayor of London, Sir Seymour Howard. The Monument system serves the busy area at the north end of London Bridge, consisting of the main junction of King William St with Cannon St, Gracechurch St and Eastcheap and the nearby minor junction of King William St with Arthur and Monument Sts. Prior to the changeover to automatic control, one police sergeant and six constables were employed in controlling the traffic which in 1952 census amounted to 28,000 vehicles between 8 a.m. and 8 p.m.

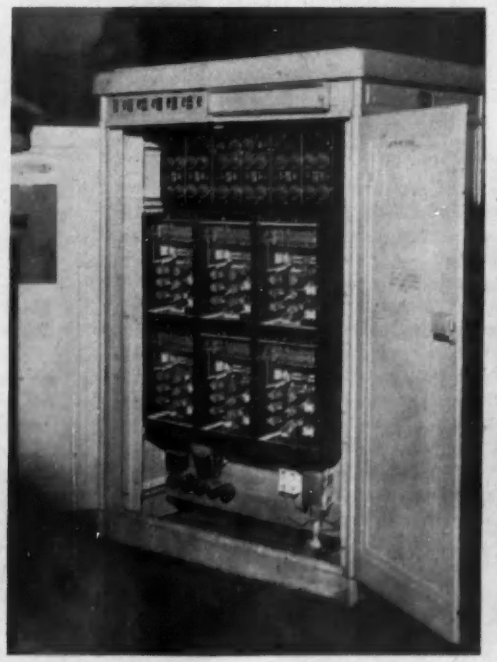
During the early part of the day free movement of traffic is complicated by a large number of vehicles leaving Billingsgate market and entering King William St from Monument St. This traffic is usually finished by 10 a.m. but its heaviest movement coincides with the morning traffic peak. It was therefore considered advisable to provide a signal system at this minor junction also and to link it, during the daytime, with the signal system at the main junction to ensure free movement of traffic between London Bridge and this main road intersection.

The link between the two controllers is effective only between the hours of 7 a.m. and 7 p.m. Monday to Friday and from 7 a.m. to 2 p.m. on Saturday. At other times the controllers work as isolated units, the changeover being effected by a time switch.

The scheme, at present in operation, is based upon a series of trials which established that the morning peak traffic could reasonably be handled during a full cycle of 85 to 90 seconds. Provision has been made for alternative control schemes which consist of variations in the sequence of traffic releases and clearance periods.

The controller for the main junction is of the "compound" type consisting of six control units housed in one feeder pillar. Each unit controls one of the six main traffic movements, the commencement and termination of each being determined by connection to the appropriate points of a 50-step cycle dividing switch. By this means, certain movements may be connected so that they run together, but are arranged to start or finish at different points in the cycle thus providing the six stages of traffic movements.

The controller for the junction of Monument St with King William St is of the two-phase, two "all-red" type, arranged so that under linked conditions additional signals are given to traffic leaving the main junction. Under isolated conditions it works as a simple two-phase unit. A manual feature is provided for operation by a police official if some unusual traffic condition makes this desirable. When the compound controller is switched to manual operation, lamps, mounted on a display panel, repeat the red and green signals of the main phases. By operation of toggle switches, right-of-way may be given to the appropriate traffic streams, a signal interlocking circuit ensures traffic safety. The signal system was designed by engineers of Automatic Telephone and Electric Co., Ltd., in collaboration with officials of the Ministry of Transport and the City of London Police.



Above. The Lord Mayor is seen switching the controller to set the automatic signals in operation. Left. In addition to all the relays required for automatic operation, manual controls are housed in the main controller. Below. Traffic is seen proceeding across this complex junction. A 1952 census showed that 28,000 vehicles passed through between 8 a.m. and 8 p.m.

TARIFF STANDARDISATION

Area Board Achievements Discussed by I.E.E.

STANDARDISATION and simplification of tariffs are amongst the duties placed on the area boards by the 1947 Electricity Act. To make recommendations appropriate to this end, a Retail Tariffs Committee, composed of senior officers of the B.E.A. and of area board chairmen or deputy chairmen was set up in 1948. Its recommendations and the extent to which they have been put into effect are reviewed in a paper "The Standardisation of Retail Electricity Tariffs" which was presented to the Supply and Utilisation Sections of the I.E.E. last Thursday by Messrs A. D. Johnson, B.SC.TECH., M.I.E.E. (N.W.E.B.) and N. F. Marsh, M.A., M.I.E.E. (N.E.E.B.).

Domestic Tariffs

At vesting day 57·1% of consumers were supplied on two-part tariffs, 30·4% on flat-rate tariffs, and 11·4% on block tariffs. In two-part and block tariffs some method of assessing consumers is necessary, and this was based on rateable value in 29·1%, floor area in 21·0% and rooms in 12·4% of all cases. The recommendations of the Retail Tariffs Committee covered a two-part tariff with an alternative flat-rate, or a variable-block tariff with two or three blocks, or two-part and variable-block tariffs side-by-side on a broad equivalence. For assessment where necessary, number of rooms was preferred, with floor area as an alternative.

Two features are worthy of note. The recommended tariff structures permit single metering, and rateable value is omitted as a method of assessment.

Most boards decided to fix the price of the primary block of units at about the average of the then existing flat rate lighting tariffs, and the follow-on rate at the prevailing running charge in existing all-in tariffs. In the initial stages the most acceptable tariff was the one which secured the desired total revenue from the consumers as a whole, but at the same time involved minimum alteration in total revenue from consumers in each room group.

By the end of 1953, ten boards were operating variable-block tariffs based on rooms, two two-part tariffs (one with an alternative-block tariff) based on floor area and one a two-part tariff and a variable-block tariff based on number of rooms. With rooms as a basis of assessment difficulties of definition have applied particularly to kitchens, kitchenettes and sculleries.

Industrial Tariffs

Two types of tariff were recommended for industrial consumers, a variable-block tariff to apply to consumers with assessed demands up to 50 kVA and a two-part tariff with m.d. charge and running charge, applicable for all demands from 5 kVA upwards. In the overlap region the tariffs were to be considered alternatives.

For the block tariff, assessed maximum demand and floor area were the recommended bases for estimating the size of the first block. Measured kVA (preferred) or kW was the suggested basis for the fixed part of the two-part tariff. M.D. charges could be on a monthly or a yearly basis, and there was a suggestion for steps in the running charge related to load factor. Two-part tariffs as recommended would normally incorporate a fuel cost clause which differentiate between consumers taking supplies at medium and at high voltages.

When an analysis was made of existing tariffs in one area, it was found that although the average increase in charges as a result of applying standard tariffs would be about the same for all levels of maximum demand, there would be far sharper increases to be paid by low-load-factor consumers. For instance, to give the same average increase in charges to consumers with load factors of above and below 27%, but still keep the same total revenue, it would have been necessary to reduce the m.d. charge by 45% and increase the running charge by 54%. There was a danger that this would drive some high-load-factor consumers to private generation, eventually necessitating increases in tariffs to offset their loss.

At the end of 1953, there were nine boards with standard industrial m.d. tariffs. Details of these vary from board to board because of the overriding need to limit disturbance to revenue and to charges to consumers. The authors consider that the structure of tariffs in the various boards will come more and more in line over the years.

Variable-block tariffs for small industrial consumers have proved somewhat difficult to introduce. The authors see little wrong with fixed-block tariffs for such consumers when their load is mainly for motive power, so that there is a high density between such consumers. There seems a need in connection with m.d. tariffs to fix a ceiling for average price per unit, to safeguard consumers with very low load factor. One way of doing this is to offer a fixed-block tariff to all industrial consumers whose principal use is for power; and thus remove the recommended 50 kVA limit.

In the opinion of the authors, when m.d. charges are on an annual (not monthly) basis, consumers should be entitled to request that the full demand charged should be levied only on demands during peak hours, say 7 a.m. to 6 p.m., Mondays to Fridays. This should not be part of published standard tariffs, but rather an arrangement freely available to consumers on request. There is also justification for a lower charge for excess demands outside the winter months.

Standby Supplies

No hard and fast rules are considered practicable for charges for standby supplies in the event of breakdown of consumer's private plant. Generally an appropriate arrangement is the capital cost of connection to the nearest existing distribution point, plus an annual fixed charge in respect of reserved distribution capacity, plus the monthly demand charge in the standard tariff adjusted for the annual fixed charge, but put at four times the adjusted monthly charge in respect of demands at any time during the four winter months; and, of course, the usual running charge.

A weakness here, the authors consider, is that the "four times" charge does not offer the consumer any incentive to get his plant back into operation quickly once it has broken down. Indeed, he may take his time in carrying out a major overhaul: and the longer the standby supply is in use, the greater the chance of the board concerned being involved in a heavy m.d. charge in respect of the whole year. Thus, some method of relating the demand charge to the period of breakdown in winter months seems appropriate.

Commercial Tariffs

Consumers classed as "commercial" cover an extremely wide range. Their principal characteristic is that in most cases lighting constitutes a high proportion of their load. Recommendations by the Retail Tariffs Committee were on the same lines as those for industrial tariffs, except that there were recommendations that the m.d. charge should be on an annual basis and that charges in block tariffs should reflect broad differences in load characteristics between different classes of consumer.

At the end of 1953, 11 area boards had standardised their commercial tariffs. In the opinion of the authors, the use of assessed demand as the basis for determining fixed charge or size of primary block has the disadvantage that it is difficult to keep the assessments up to date without regular visits to consumers' premises. Floor area seems more appropriate, but some allowance must be made for different types of consumer—a shop and a village hall cannot be classed together on this basis. Although measurement of floor area is troublesome in the first instance, since the number of consumers is comparatively small, it is far easier to apply than with domestic consumers.

Commercial catering offers a largely undeveloped potential demand for electricity supplies which could help fill valleys in the load curve. What business can be obtained depends largely on the tariff offered. The most suitable forms are flat-rate or a block tariff in which there is only a small margin (say one farthing) between price per kWh in the primary block and follow on units.

Farm Tariffs

Divergence of opinion as to what constitutes a farm is a difficulty still holding up the standardisation of farm tariffs in some boards. The Retail Tariffs Committee recommended domestic tariffs for the farmhouse and a tariff of similar form for uses outside the farmhouse, but with assessment of fixed charge or primary block for this part of the demand based on assessed demand or on floor area. In the event, four of the nine area boards which had standardised farm tariffs by the end of 1953 used installed load, the others assessed demand, farm acreage, floor area of farm buildings, maximum power requested, and transformer capacity, respectively.

Much difficulty in regard to floor area assessment arises in dealing with open-sided buildings and with portable poultry houses, etc. When assessed demand is the basis, there is difficulty in keeping up to date.

Restricted Hour Tariffs

Off-peak terms on a national load-curve basis can be offered between 6 p.m. and 7 a.m. with an afternoon "cut-in" period permitted for thermal storage installations. Where requested noon Saturday to 7 a.m. Monday should also be allowed for off-peak charges. Thermal-storage and battery-charging are loads involving long-hour use of electricity and justifying a low charge per kWh not carrying the normal kW-demand charge component of industrial or commercial tariffs. Some special arrangements are needed for the cost of a special service for such loads, where necessary, but apart from this, the authors consider that energy should be available at a flat-rate charge approximating to the unit charge of the standard industrial or commercial tariff. Flood-lighting and advertisement signs usually use electricity for a shorter time, and such a low rate is not justified. An appropriate tariff would be a flat-rate at about mid-way between the price in the highest and lowest kWh charges in the commercial block tariff (i.e. between 2d. and 3d. per kWh at present).

For domestic supplies, it is difficult to offer off-peak terms for water heating because the controlling time-switch would probably cost more than any tariff advantage gained by the consumer. A reduced follow-on rate in block tariffs might be a more practicable way of encouraging consumption.

Outside the B.E.A.

The authors do not confine themselves to the 14 Area Boards. In the course of their paper, they make references to tariffs in the North of Scotland, Northern Ireland, and in several continental countries.

For domestic tariffs, the North of Scotland H.E. Board has a standard three-block variable block tariff, with the assessment based on the number of habitable rooms. The Electricity Board for Northern Ireland offers several domestic tariffs, including a two-part tariff based on floor area assessment. Belfast offers a two-part tariff based on rateable value, with alternative flat rates, while the Londonderry Electricity Undertaking has an all-in two-part tariff based on the number of rooms.

No mention is made of standard industrial tariffs outside the B.E.A. areas, but information is given on commercial tariffs. In the North of Scotland district, there is a variable-block tariff of the three-block type, with assessment based on a combination of floor area and load of motors. In the area of the Electricity Board for Northern Ireland, several tariffs are available to commercial consumers, one a two-part tariff with a fixed charge based on floor area. The fixed charge rate for shops and offices is three times that for hotels, clubs, larger boarding houses and guest houses. In Belfast, the domestic tariff is followed, with a two-part structive based on rateable value. Londonderry offers, in addition to several flat-rate tariffs for different commercial uses, a block tariff of the two-block type with the primary block assessed on lighting maximum demand.

Farming is of special interest in the North of Scotland, and there the tariff consists of a combination of the domestic tariff for the farm house and the commercial tariff just described for the farm buildings and agricultural apparatus. However, the first 20 kW of agricultural apparatus is excluded from the installed load assessment for this purpose.

In Germany, Sweden, Finland, Switzerland and Belgium the principal domestic tariff is a two-part or three-part tariff with assessment based on the number of rooms. In Denmark a special committee recommended alternatives for the domestic tariff based on rooms or floor area. France has not yet advanced very far with tariff standardisation.

Again, little appears to have been done to standardise industrial tariffs on the Continent, but for commercial purposes two-part or three-part tariffs based on floor area have been adopted for lighting in Sweden, Finland, Denmark and Belgium. In general, there are separate tariffs based on installed load for heating and power. Floor area assessment is varied according to the type of premises, as many as seven classes of commercial consumer being recognised in Denmark.

Farm tariffs in Germany, Finland, Sweden and Switzerland have an assessment based on the area of cultivated land so far as farm use, as opposed to domestic, is concerned. In some cases there is a supplementary assessment based on installed load for motors. In Denmark farm tariff assessment is based partly on tax valuation of the property and partly on installed load.

Conclusions

The recommendations of the Retail Tariffs Committee have been criticised on the grounds that they are not sufficiently definite, but the authors disagree with this view. Once area boards have overcome the initial diffi-

culty of introducing their own standard tariff structures, with the least disturbance to individual consumer's accounts, they will be able to examine the tariffs of neighbouring Area Boards with a view to minimising the differences.

The authors consider that for domestic consumers and for small commercial and industrial consumers, the block tariff is preferable to the two-part tariff because it is more easily understood by consumers and because it will remove the need for an alternative flat-rate tariff as a means of limiting the total price per unit. In the opinion of the authors, fixed-block tariffs will eventually come into general use, abolition of the need for assessment and simpler accountancy being decisive factors in favour of such tariffs.

DISCUSSION

MR C. T. MELLING (Eastern E.B.), opening the discussion, said that the industry's tariff practices and policies before vesting date had on the whole been very good, and when the Retail Tariffs Committee met after nationalisation they felt that they owed a debt to their predecessors and that they should retain the best of what had been done, improving it if possible and try to evolve a general pattern which would produce equity while allowing a reasonable degree of experimentation. They did not think that a point had been reached when systems of charge could be standardised once and for all.

He did not agree with the authors that to limit disturbance to consumers was a "paramount" consideration; the relationship of one tariff with another and the essential fairness of the method of charge were more important. All the Boards had had to regard disturbance as important, in view of the political consequences which would be caused by an undue amount of change. This meant a reluctance to change a method of charge which was operating satisfactorily. Greater consideration must be given to the restricted-hour tariff to fill in the large night valley which still existed. It would be a mistake if it were necessary to adopt the same tariff structures throughout the country; the demand for standardisation came not from consumers but from "people of the planning type, with tidy minds," and a doctrinaire approach should be resisted.

MR A. W. JERVIS (Debenhams), speaking as a consumer and dealing with the commercial tariff, thought there was no justification for the floor area basis of assessment except for very small consumers in single premises, and referred to two stores having the same installed load and consumption one of which paid 75% more than the other simply through having twice the floor area. What had been wrong in the past was not so much the multitude of tariffs as the wide range of costs.

MISS A. S. LOCKHART (E.A.W.) suggested that consideration should be given to individual domestic consumers in cases of hardship and that, when big changes were introduced, consumers might be offered the choice of the existing or the new tariff for a period of three years. She wondered whether complete standardisation might be possible; in some Areas consumers paying the standard tariff less a penny in the shilling and in others the standard plus a penny in the shilling. At present the only advocate for the consumer, apart from the E.A.W., was the Gas Council. It was a relief to know that there was a very active body in the background which was aware of what the electricity supply industry was doing.

MR R. H. RAWLL (L.E.B.) thought that the Retail Tariffs Committee had been too timid in their recommendations; now that there were only 14 instead of over 500 bodies to tackle the problem a greater measure of agreement could be expected. Surely in the domestic field a stage had been reached where one method of charge could be standardised? Ten Boards had adopted the variable block tariff based on rooms, so that already there was very nearly standardisation.

MR E. W. DOREY (Consultant) dealing with industrial tariffs, said that between 1939 and 1954 the cost of fuel increased by 45s./ton, but domestic charges had fallen during this period by 0·033d./unit, while industrial charges increased by 0·492d. It seemed, therefore, that the burden of increased fuel cost, which amounted to 0·43d./unit, was not being equitably distributed amongst tariffs with and without a fuel clause. On the subject of disturbance, if tariffs were to be established on a sound economic basis there should be complete disregard of the effect as to increase or decrease to the individual user, and people should pay what they ought to pay for a bad load factor. If economics rather than expediency was the governing factor in an industrial tariff a common structure could be adopted throughout the country.

MR G. O. MCLEAN (South-Western E.B.) expressed bitter disappointment with the paper. It did not tell those in the supply industry a single thing they did not know already, while to those outside it might give a wholly wrong impression. He had expected to find in it some reference to the technique of tariff-making and logical reasons for certain tariffs being recommended by the Retail Tariffs Committee and adopted by Area Boards. Instead of this, the ordinary reader would gain the impression that all that had happened since 1948 had been the raising of price elements in the most popular pre-vesting tariffs in such a way as to give increased revenue and cause the least disturbance to customers. The supply industry should strongly emphasise that tariffs were based on cost analyses.

MR B. L. METCALF (N.C.B.) mentioned that the S.W. Division of the Coal Board took a supply from three Area Boards and in one case paid 30% more than in another for comparable supplies with the same load factor. There was some merit in paying the same price for petrol everywhere, averaging out the distribution charges. It was true that there were zonal prices for coal, but the Coal Board had to pay them back in the cost of electricity, due to the coal clause. The Coal Board had an extremely good load spread all over the country, with a load factor of about 55%, and took over 2½ m units per annum, but paid tariffs which varied by as much as 40%.

MR D. J. BOLTON (B.E.A.) said that the form of tariffs in the nationalised industry could involve two things: unification and improvement. It might have been hoped that both could be carried out simultaneously, but it was obvious that the authors had no such ideas; their objects were to safeguard revenue and limit disturbance. Stage I thus became a statistical exercise to find the lowest common multiple of consumer disturbance. If that aim of "uniformity without tears" were accepted, it must be agreed that the Boards had done a wonderful job in bringing some order out of chaos. "We can only hope," he remarked, "that having got us all on the same boat they will now go to Stage II and indicate the haven into which they hope to steer it."

MR G. RHEAM (Associated Portland Cement Manufacturers), expressing a personal view, said that the tariff he would like to see for industry would have three parts. The first would be a service charge based on kVA capacity required and designed to recover the fixed costs on the board's lines and apparatus required to give that supply. To be logical it should be stepped. Secondly, there should be a stepped demand charge, designed to recover the remaining demand-related costs and chargeable only during the morning and afternoon peak hours on Mondays to Fridays in December, January and February. Thirdly, there should be a stepped unit charge, with no element of fixed charge in it, and with an appropriate differential between h.v. and l.v. supplies.

MR K. H. TUSON (Mackness and Shipley) suggested a further small measure of standardisation, that of the basic price of coal on which the coal clause operated. Within the last year he had seen new agreements in which the old figure of 14s./ton was perpetuated. Service charges, he said, caused more heartburning than any other element. Their incidence was haphazard, and anything that could be done to even them out would be of great value.

MR A. E. MARCHANT (L.E.B.) suggested that for the smaller commercial consumers a fixed block basis, say with three blocks, might be advisable.

Both authors replied briefly to the discussion. Mr N. F. Marsh did not agree that the word "paramount" applied in the paper to the need to avoid consumer disturbance, was too strong. In the initial stages, if they had not considered disturbance to the consumer, some people's tariffs would have gone up by 300% or more. He agreed with Mr Bolton that there were two stages in the process. Stage I was almost complete, and the Retail Tariffs Committee were now considering Stage II, but it would take some time to do so.

The Chain Store and the Wholesaler

E.W.F. President warns Manufacturers

THE Annual Dinner of the Electrical Wholesalers Federation is one of the more popular and enjoyable functions of the year, and last week's gathering was no exception. The principal speaker, Sir W. Wavell Wakefield, M.P., who proposed the toast of the "Electrical Wholesalers Federation" presented the case for free enterprise in no uncertain terms. He hoped that the profits made by wholesalers would rise, as good profits restrained the demands made on the individual for tax. There was no reason why good profits, good production and good wages could not exist simultaneously with low prices. The Electrical Trades Union took advantage of every possibility, without regard to the convenience of the public, of increasing the wages of its members. In the nationalised industries where full monopoly existed, prices could be altered to suit the needs of these industries. Free enterprise with stability of price was of the greatest importance. In state monopolies, party political considerations became disproportionate.

In the present world, no subject of the Queen could have liberty unless he were a member of an Association or Union which could represent views to the Government. If an industry spoke with different voices, it was impossible for the Government to take action; if there was one voice it was bound to have an effect. It was no good for an industry to produce the best and cheapest equipment if it could not break down political and economic barriers. While the Government should keep out of trade and commerce, it should also play a leading part in international organisations to ensure as far as possible stable trading conditions.

We ought not to be depressed when new countries started secondary industries within their own borders. The more they developed the greater would be their needs. Demand would arise for capital equipment of all kinds, and this in turn, by raising living standards, would produce a requirement for more consumer goods. We as a trading nation needed to keep ahead in research, production and salesmanship.

Chain Stores

Replying, Mr W. Crisp, President of the E.W.F., referred to the huge growth of the chain stores, which affected many industries and certainly the electrical industry. The uncontrolled growth of the chain store business could be disastrous for the manufacturers and the retailers—and consequently the wholesalers. The manufacturers could very easily find that all their eggs were in one basket, and the retailers, because they could be forced into bankruptcy by the chains.

The chain stores had come to stay. They enjoyed considerable advantages as they had colossal orders to place for delivery in huge consignments to a central warehouse—a tempting bait for many manufacturers, especially as deliveries would often be taken in out-of-season periods, and accounts settled on a seven-day basis.

Some manufacturers had granted certain concessions, the equivalent of wholesale terms, not appreciating the fact that buying in bulk was one of the jobs carried out by the *bona fide* electrical wholesalers. Another important advantage was the lower hire-purchase terms offered by the chains.

How did the position affect the retailer? Normally the retailer enjoyed a discount of 25%, and only a few retailers were large enough to obtain anything in the way of substantial quantity terms. The available terms to the chains of a profit approximately 15% to 20% over the normal retailer's profit meant that they were in a much better position to indulge in large scale advertising, provide showroom facilities and operate a transport service for the convenience of customers.

If the chain store growth continued at its present rate, manufacturers would find their normal retailing outlets disappear and the only customers would be the large groups who, without competition from the small retailer would be in a dictatorial position as far as manufacturers were concerned. If the normal retailers were to disappear, manufacturers might well find difficulty in disposing of the high quality and hire-purchase products which would not be popular with the chain store firm.

That was the position, and it remained to seek some form of control. In the near future, it might be necessary for the wholesalers and the retailers who are associated to take steps to reach an agreement to refuse to distribute manufacturers products if they were also distributed by the chains.

The toast of "The Guests" was proposed by Mr R. E. Silvey, Vice-President of the Electrical Wholesalers Federation, the response being by Mr V. C. H. Creer, Chairman of the Electric Lamp Manufacturers Association. Mr Creer referred to industry today as being at the mercy of politicians. The Electric Lamp Manufacturers Association had been the first to come under the scrutiny of the Monopolies Commission and had come out with flying colours. It had done what the Commission had told it to do, and could face any Government whether Conservative or Socialist without fear. The industry was facing severe competition from abroad. It was not reasonable to expect to beat the Japanese with their low labour costs, if we were to continue to give employees in this country good wages, holidays with pay and security.

As far as chain stores were concerned, he thought that no manufacturer could afford to deal direct with chain stores, and that wholesalers were vital to the manufacturer.

The President utters a warning

Switchgear for 250 MVA at 11 kV

BRUSH RANGE FOR INDUSTRIAL AND DISTRIBUTION USE

THE class VBA switchgear newly introduced by the Brush Group has been designed to meet the present-day requirements of area boards and industrial users for equipment to operate on 11 kV and 6·6 kV systems with rupturing capacity ratings of 150 MVA on 6·6 kV and 250 MVA on 11 kV. The switchgear, which is of orthodox double-break design, is suitable for use on 3-phase systems earthed to permit the use of standard circuit-breakers in accordance with clause 20 of B.S. 116:1952.

Oil circuit-breakers

The Q type circuit-breaker is embodied in the unit, and those breakers with a capacity rating of 150 MVA at 11 kV are filled with contacts of the normal circular segmental type and use brass for the fixed and copper for the moving contacts. For the higher capacity of 150 MVA at 6·6 kV and 250 MVA at 11 kV, the fixed contacts have an extended contact with a copper tungsten tip, and a tip of similar material is fitted to the moving contact. These reduce contact burning. Arc duration is never greater than four half-cycles over the full breaking range, and at 100% duty it is about 2 half-cycles. Arc control devices are of the side-vented baffle type.

The circuit-breaker is carried on a framework of rolled steel sections, stiffened with angle and channel sections, and is raised and lowered by means of two lifting screws with bevel gear drive. The fixed housing is of folded steel sheet and comprises two main portions, the bottom section forming a compartment for the circuit-breaker truck, and the top section, divided again into two, carries the busbars and the current transformers. The positioning of the c.t.'s is such that the voltage transformer can be included in the protected zone on feeder equipments.

Two further separate compartments of folded steel are used, one for the mounting of links, fuses and indicating instruments, and the other for the accommodation of protective relays.

The standard c.t. chamber has been designed to accommodate three bar-type c.t.'s per phase (main protection, back-up protection and metering) or, two wound type c.t.'s for main and back-up protection. In the latter case if it is necessary to provide metering c.t.'s then a deeper chamber can be provided. Protection for isolating contact orifices is by means of welded sheet steel shutters which are operated by a positive drive from the raising of the circuit breaker. They close by gravity and are assisted by a spring when the breaker is lowered to the "isolating position." Each set of shutters can be individually padlocked. In order to facilitate the insertion of test spikes, the appropriate shutter can be opened by hand, and is kept open by a special catch. This catch can be released by hand, or automatically from the shutter operating drive.

Secondary Circuits

The secondary terminals consist of round split pins and sockets. The fixed sockets are located in the bottom of the instrument chamber and form terminals for the secondary wiring in this compartment. The moving pin assembly is located and moves with the adaptor front plate of the truck and is connected by means of a flexible tube to the trip coils. This arrangement allows the plug-box to be removed from its sealing and plugged into the fixed sockets when the circuit-breaker is lowered or the truck is withdrawn for maintenance purposes. The engineer can thus test his tripping and closing circuits with the circuit-breaker in its isolated position.

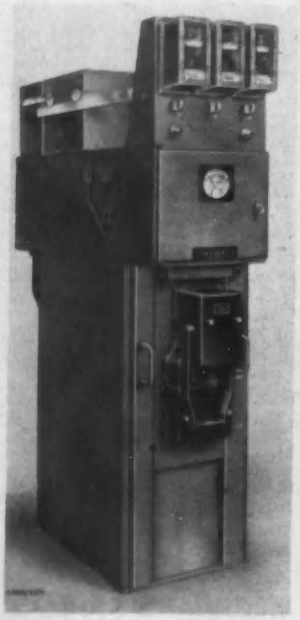
The plug box is released by depressing two small push buttons on the side of the box and lifting the box from its fittings. It can then be plugged into the fixed housing and is automatically engaged in its normal position so that when the circuit-breaker is lowered from its service position it will automatically break the circuits.

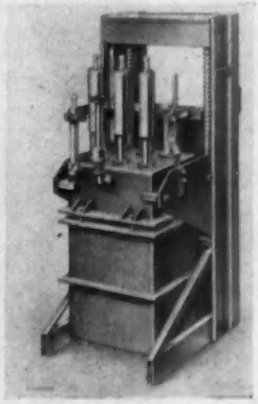
Interlocks and Locking

The switch truck cannot be withdrawn or moved into the housing unless the circuit-breaker is lowered to its "withdrawal" position. The circuit-breaker itself can only be closed in one of three positions (*a*) the service position, (*b*) the isolating or earth position, and (*c*) the withdrawal position. The circuit-breaker cannot be lowered from the service position unless it is open, and it is not possible to rack the circuit-breaker into position unless the tank is bolted in position.

The earthing gear has been arranged to cover earthing of either the busbar or feeder with the same equipment. The shutters of that part which is not to be earthed may be padlocked closed. A trip-locking pin may be provided to render manual and electrical tripping of the circuit-breaker inoperative during earthing.

The standard unit is provided with one cable box suitable for rear access, and the cable gland can be accommodated on the centre or at an angle to suit left hand or right hand entry. The glands are suitable for cables up to 0·3 sq in., and are mounted well above floor level.





The front view of switch unit is shown on the left. Below is the circuit-breaker to show the contact arrangements. This unit is fitted with an earthing contact

D.C. Tests for Stator Coils

AMERICAN CLAIMS SHOWN FALSE

RECENTLY much attention has been given in America to the use of high-voltage direct current for the over-potential proof-testing of machine insulation. It has been claimed further, that the h.v. d.c. test gives a means of establishing insulation quality non-destructively, through observation of the current/voltage relationship. Such a method is attractive, and tests have been carried out in this country to check its effectiveness. In a paper read to the Supply Section of the I.E.E. last week, Messrs R. T. Rushall, A.M.I.E.E., and J. S. Simons, B.SC.(ENG.), A.M.I.E.E. (both with B.T.H.) describe such tests, and record the opinion that the h.v. d.c. method has in fact no valid basis for non-destructively indicating the serviceability of the insulation of h.v. machines.

Though such a negative result is naturally disappointing, the claims that have been made elsewhere for the success of the method make further examination of the evidence worth while. Before embarking on this, some general consideration of the relative merits of a.c. and d.c. testing seem in place.

Over-potential testing with d.c. introduces many new factors. For instance, the relative severity of a.c. and d.c. testing has to be considered. A d.c./a.c. (r.m.s.) ratio of 1·6 has been suggested, but much depends on the nature of the insulation. Again, with d.c., distribution over the end windings is determined largely by surface resistance, whereas with a.c. it is principally the capacitance that is effective. One advantage claimed for d.c. testing is that a.c. testing causes greater deterioration of the insulation, but it is suggested by the authors that normal a.c. over-potential testing has a negligible shortening effect on the life of a winding.

Proving Tests

The suggested a.c. test requires the measurement of the steady-state leakage current between winding and core at successive increments of test current up to a maximum of

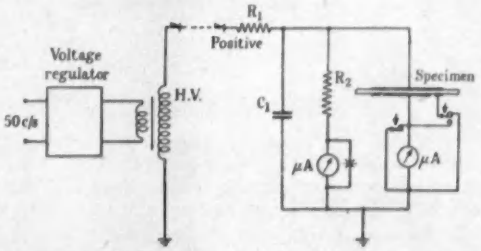


Fig. 1. Test Circuit used in investigations. R_1 = 5 megohm, C_1 = 1,200 pF, R_2 = 160 megohm

about twice the a.c. test voltage (46 kV d.c. for a new 11 kV machine). It has been claimed that if the breakdown voltage of the weakest point of the winding lies within this range, it will be shown by a sudden trend towards high current and low resistance.

A start on testing was made with the circuit shown in Fig. 1, which gives a direct voltage variable between 0 and 100 kV, using 5 kV, 5 mA selenium rectifiers. Good quality insulation was treated first, and samples with faults intentionally introduced later. Tests were performed with the voltage "through" the material, and also along the surface: these tests were called volume-leakage and surface-leakage respectively.

With volume leakage tests, effectively straight line curves were obtained for mica splittings when conductivity as shown by the tests was plotted against voltage stress. Examination of the results suggests an ordered process of conduction, continuous up to breakdown. With mica-folium and black varnished cloth, some inconsistencies

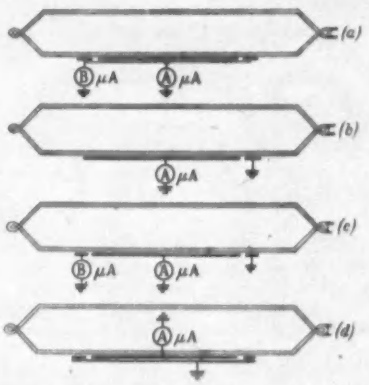


Fig. 2. Electrode arrangements for tests on coil. (a) Unguarded (A+B), guarded (A) from both end-windings. (b) Unguarded from non-connection end-winding. (c) Unguarded (A+B), guarded (A) from non-connection end-winding. (d) Guarded from both end-winding and screened

were noted. In general, however, plotted curves showed only the changing conductance of materials up to the point of breakdown. There was an absence of any sudden change in slope indicative of approaching failure. The use of insulation resistance plotted against current, which had been advocated by some investigators, seemed to offer no real advantages. The claim was that this curve if extrapolated, predicted failure at or near the point of intersection with the voltage base.

Surface leakage tests, in contrast, gave a marked increase in current before breakdown. However, this increase was primarily the result of gaseous discharge, and the breakdown so predicted was that in air. There was an absence of any inordinate current rise when tests were made with the sample immersed in oil.

Next, flat sheet specimens with various artificial faults introduced were tested. In no case of a "volume" test was the presence of a defect reliably indicated in the course of a current/voltage test. With surface defects, there appeared more chance of prediction, but the results were considered to demonstrate the essential unreliability of the tests. Bends in the current/voltage curve were shown to depend upon the surface or near-surface conditions prevailing.

When an old 11 kV synchronous motor stator was tested to breakdown, again there was no obvious warning of impending failure. Moreover, all breakdowns during the tests occurred on end windings, whereas service experience shows that the greater part of all stator-winding failures originate as turn-to-turn faults in the slots.

Coils taken from various parts of the stator winding, and arranged as in Fig. 2 were also tested. The results suggested that leakage currents with the coils unguarded

(Fig. 2a) could overwhelmingly influence results when testing a stator.

Investigations of the nature of the d.c. leakage currents on complete coils were made with the arrangements of Fig. 2(b) to check the effect of dirt, 2(c) for the effect of guarding, and 2(d) for the effect of external corona. The effect of an end-winding fault was also investigated. It was concluded that dirt on the end windings has some influence on the current/voltage curve, but that clean surfaces on coils which have been in service can lead to intermittent charge/discharge effects. The effect of guarding is marked, and any external corona discharge in the vicinity of the test can contribute materially to the current/voltage characteristics obtained.

Conclusions

The authors conclude that tests of the type described can lead to no real judgment of the electric strength of the slot insulation. Whenever a sudden increase of current, suggestive of approaching failure is obtained in such tests it is derived principally from discharge and leakage tests in the end winding, which differ so materially from those under a.c. conditions as to render the results irrelevant to an a.c. machine in service.

DISCUSSION

MR E. JONES (English Electric) agreed with the authors that the amount of deterioration likely from normal alternating over-potential tests curtailed the life of a winding by an altogether negligible amount, though this was true only in the case of well-made insulation. It seemed to him that the d.c. test would be less stringent than the a.c. test if the insulation was not well made, or if it contained materials which were susceptible to attack by discharges. Therefore a d.c. test might possibly pass insulation which was inferior for a.c. use.

MR A. W. STANNETT (B.E.A. Research Laboratories) emphasised the desirability of non-destructive tests. It was a pity that the results of the authors' test were completely negative, but that could not be helped. They had shown, however, that artificial faults due to voids could not be predicted by the d.c. tests carried out over voltage range. He thought an analysis of types of stator coils would be valuable, though it would seem that the major type of breakdown that had to be contended with was breakdown by discharges. Insulation-resistance tests were being carried out on machines in service, and though they were far from easy to apply in service, it was hoped to obtain sufficient data to give at least a general indication of the condition of the machine.

MR D. SMITH (E.R.A.) described the application of the d.c. over-potential test to two alternators. They behaved quite differently, he said, although each gave a rising resistance curve on voltage. One showed a fairly flat characteristic but did not give any prediction of failure. The other gave "reasonably good" prediction of failure. When they were subsequently tested to breakdown on a.c., the second had about 1·4 times the d.c. prediction level. The other broke down at the slot, as the authors would expect from their analysis. The authors had so thoroughly condemned the use of current/voltage measurement as a test for alternator insulation that they might have put the whole of d.c. testing under a cloud. Where the field distribution in d.c. and a.c. was not so different, the d.c. test was very useful.

MR F. S. EDWARDS (Metropolitan-Vickers) said the authors had positively and unequivocally stated that the high-voltage d.c. method of testing had no valid basis as a means of assessing the serviceability of the insulation of stator coils. Cameron, on the other hand, was the chief and almost the only supporter for the opposite view. The problem was to decide between two well founded but mutually exclusive conclusions. Cameron's chief supporter in America had, like Cameron, worked with old machines and it might well be that Cameron's deductions were correct for extremely old machines but invalid for the newer ones. The fundamental objection to almost any test on a complete machine was that while it gave average power factor or the sum total of leakage currents, it did not show how much scatter there was in the results.

MR L. D. ANSCOMBE (B.T.H.) pointed out that the investigation arose in the first instance from the hope of an associated department in the organisation that it might be possible to recommend high-voltage d.c. testing to users as a means of assessing stator insulation after years of service and possibly also as a means of quality control in the production of coils. They had been led by enthusiastic reports from the U.S.A. to believe that this might be the ideal method for both functions. They had now altered their opinions considerably. The present investigation had recently been supported, he believed, by information recently published in the States. The main disadvantage of high-voltage d.c. testing was that it appeared to fail completely to pick out defects in the slot portion which were likely to lead to trouble in service, while virtually seeking out what might be described as spurious weaknesses in the end-windings.

MR L. W. JAMES (B.E.A.) said the authors' conclusions were disappointing, particularly as his organisation, with a view to obtaining a useful test for turbo-generators, had followed American and Canadian publications closely. From the information given in them, it did appear that satisfactory results had been obtained over the past five years or more. The rate of breakdown was nothing like so serious as in the hydro-electric case. Even so, failure in service was very serious.

MR T. H. MILNE (B.E.A., North Eastern Division) said it was amazing that American investigators, who must be regarded as thoroughly responsible people, had achieved positive results from high-voltage d.c. testing. No reasons were given in the paper, and he himself had no clue to them. in the North Eastern Division of the B.E.A. tests had been made on an old machine built in 1917 which had been idle for seven years. No attempt was made to clean the windings which were dirty and the aim was to find ways and means of detecting and repairing faults in the windings as rapidly as possible. The test, which had not gone very far yet, was a kind of probe test, and evidence was obtained of a large increase of current at spots already located in the probe test. A high-voltage d.c. test to breakdown of windings which followed bore out the conclusions reached by the authors.

MR W. J. CARFRAE (B.T.H.) said that his experience of d.c. testing went back to the middle thirties when he was concerned about the spate of American literature purporting to show that it would predict failure. Until the appearance of the authors' paper the subject was apt to go by default, as nobody had disagreed with the American authors. As a result of tests, the conclusion had been reached by his company that d.c. testing was of no value in proving the "goodness" of insulation. It was of some value, however, on repair and maintenance jobs though not for predicting anything.

Stress-relieving on Atomic Reactor

ONE of the most unusual and interesting techniques now being devised to solve problems in the testing of atomic power station plant and equipment was applied recently at Calder Hall nuclear power station. The problem was how to "stress relieve" the "reactor casing"—a huge cylindrical vessel made by Whessoe Ltd., of Darlington. The vessel is forty feet in diameter, sixty feet high and weighs four hundred tons. As there was no gas heated furnace sufficiently large to take this vessel, the decision was taken to heat it electrically.

A network of stainless steel tubing two thousand feet in length was installed inside the vessel. A heavy electric current passed through this framework raised it to red heat. Special arrangements had to be made to make available the 1,500 kW needed for this process. It took several days to raise the temperature of the steel walls of the vessel to the required temperature, at which the vessel was maintained for some hours to complete the stress relieving operation. Thereafter it was allowed to cool down very gradually to normal temperature.

POWER SUPPLY Statistics

FEBRUARY

As can be seen from the diagram of new generating plant, very little commissioning of new machines took place during February. In fact, only one set, a diesel driven alternator for Southend Station (Eastern Division) is recorded. Like the other set commissioned here in December, it has a rating of 0·95 MW and is of English Electric manufacture. On the steam side, however, three boilers were commissioned. Of these, one goes to the North West, Merseyside and North Wales Division's Ince Generating Station. It is a 550 klb/hr, International Combustion unit and is the second for the station, to drive 60 MW, G.E.C. turbo-alternators. The other two are recorded at Clyde's Mill Generating Station, South West Scotland Division. Of Yarrow manufacture, they have a 180 klb/hr rating, delivering steam at t.s.v. conditions of 625 lb/sq in. at 875° F.

The net increase in the total installed capacity is 1 MW, the total now standing at 20,607 MW. That of the B.E.A. fell by 1 MW to 19,971 whilst the North of Scotland Board's total rose by 2 MW to 636 MW. The overall total now stands at 1,438 MW, 7·5% higher than the corresponding total for February last year.

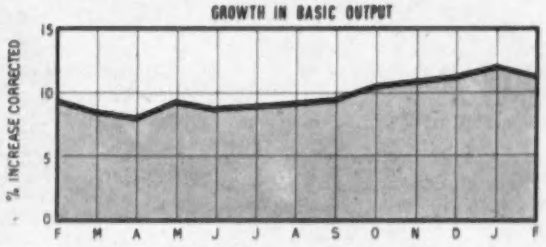
Of sales of energy, the February picture again tells a story of continued progress. Overall, units sold by the Central Authority in February were 10·1% more than the same month last year. Affecting this increase, however, were the somewhat colder conditions this year—an average temperature of 35·5° F against 36·7° F for February 1954—which when allowed for in the percentage increase, show it to be 11·3% which indicates the basic growth in load being experienced by the B.E.A. Looking at Area Board progress, it is seen that sales are nowhere less than 5% more than February 1954, and again the South Western Board heads the list, with a rise of 14·8%. As in previous months also, direct sales by the B.E.A. are well up on the corresponding month last year, the increase being 54·4%.

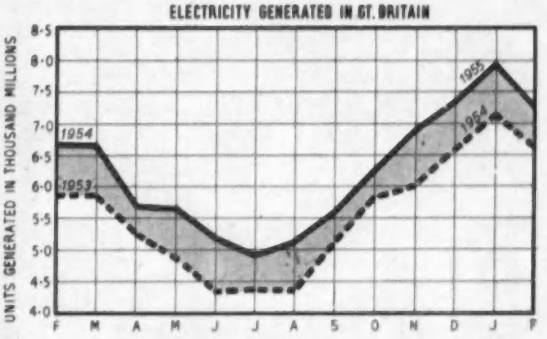
B.E.A. Sales to Area Boards in February

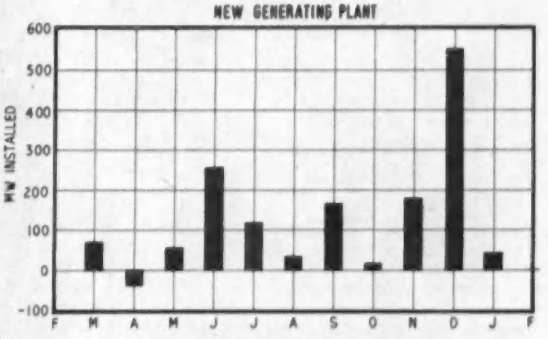
Area Board	February total in million units	% age inc. on Feb. 1954
London	659·0	7·5
South Eastern	381·3	6·6
Southern	453·5	10·8
South Western	228·4	14·8
Eastern	616·1	8·1
East Midlands	511·4	11·4
Midlands	690·8	10·2
South Wales	357·3	10·3
Merseyside and North Wales ...	385·9	12·5
Yorkshire	646·4	10·2
North Eastern	365·9	7·2
North Western	707·1	7·7
South East Scotland	147·5	12·9
South West Scotland	344·5	9·7
Direct Sales by B.E.A.	132·9	54·4
Grand Total	6,628·0	10·1

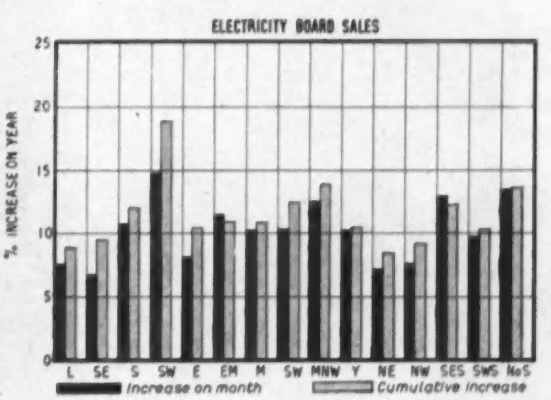
In terms of units, energy sent out by the two Authorities in February amounted to 6,880 million kWh, 94·2% of the total of 7,299 million kWh generated. To this total, the B.E.A. contributed 7,147 millions and the N. of S. H.-E. B. 152 millions, whilst 7,149 million units were generated by steam stations and 135 millions by water power.

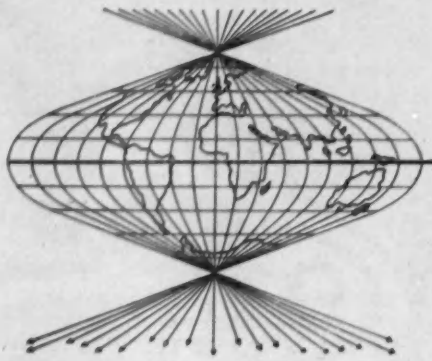
In view of the Ministry of Fuel and Power's statement on Monday, it is worthwhile to consider power station coal stocks, regarded by Mr Lloyd as being "at a safe level." On 5th March there were 3·62 million tons, whereas at the corresponding period last year 4·33 million tons were being held.











OVERSEAS NEWS

A SUMMARY OF IMPORTANT EVENTS

CANADA

Quebec's Increase

An increase of 11½% in units sold during 1954 is reported by the Quebec Power Co. Sales totalled 687·4 million units, while the system peak load was 166,700 kW, compared with 149,175 kW in 1953. The number of consumers increased by 5,005 to a total of 104,271, the greatest increase taking place in the suburban area surrounding Quebec City, where residential construction was very active. The average annual consumption per residential consumer also jumped from 2,273 units in 1953 to 2,598 units last year. The company also operates a gas undertaking which reports a slight decrease in business.

Manitoba Report

Net consolidated profit of the Manitoba Hydro-Electric board and the Winnipeg Electric company and subsidiaries for the fiscal year ended 31 Mar. last, amounted to $1,707,747. This is revealed in the third annual report of the Manitoba Hydro-Electric Board, tabled in the Legislature recently. Units generated by all board-controlled plants during the year increased by 7·6%. The record peak carried by the system—364,000 kW—occurred in Jan. 1954.

Underground Cables in Toronto

In the last five years the Toronto Hydro-Electric System has spent over $8 millions putting its primary lines underground in the downtown area, Mr B. Merson, chairman of the Toronto Electric Commissioners, states in the annual report to the City Council. During that time 417 miles of duct had been completed, together with 670 manholes and 53 transformer vaults. While stressing that the Commission would continue its programme of underground installation in certain areas, he emphasises that to place all the primary lines in the city underground would cost $45 millions, while the cost of a complete underground installation of all Hydro lines would run to $225 millions. Also, consumers would be put to considerable expense to receive an underground service instead of the present overhead. Therefore, although complete removal of overhead wiring might be desirable, it was not so readily practical, especially when the effect of the huge cost was considered in terms of rates to consumers. The report also points out that in the new underground installations, street disturbance was kept to a minimum by providing for other services where the duct was put in. But this had resulted in Toronto Hydro getting all the blame for the streets being torn up. Mr Merson also estimates the cost of 60-cycle conversion work at $5 millions, including the cost of changing or replacing 191,264 meters.

CHILE

More Plant Installed

Until recently suffering from a chronic power shortage, the Chilean port of Arica is now in a happier position following the installation of British diesel plant, which has encouraged the establishment of several new industries there. Under an order given by the Chilean State Railways, three Mirrlees/Brush 1,000 kW diesel generating sets are now in service. The sets use supercharged 4-stroke vertical engines developing 1,600 b.h.p. (1,425 b.h.p. at site) at 428 r.p.m., coupled to 1,000 kW, 6·6 kV, 3 ph. 50 cycle alternators. Each alternator is controlled by 6·6 kV switchgear, also made by the Brush Electrical Engineering Co. Arica's distribution system was d.c. two-wire 220 V carried on wooden poles, but this is now being changed over to a three-phase h.t. and l.t. distribution, so there should also be opportunities for the sale of British domestic appliances. There is a 6·6 kV ring main feeding into four substations. The town has been divided for supply purposes into four independent districts. Each district is supplied with electricity from a 315 kVA transformer having a voltage ratio of 6,600/380/220 V. The substation is of very simple design, the transformer being connected by fuse switches to the overhead l.t. main ring and on the l.t. side through Brush oil circuit-breakers. The system is so connected that in the event of a transformer failure, supply from one of the neighbouring substations can be interconnected on to the l.t. side at 380 V.

EUROPE

Contract Competition

There has been keen international competition for the contract for the first stages of the electrification scheme for the Portuguese railways under the six-year economic development plan. It is now reported that the contract, valued at around £5 millions, has been given to a group of continental firms, in this instance working together, but who normally compete against each other. The firms are French, Swiss, German and Portuguese. A British group of companies consisting of English Electric Co., Metropolitan-Vickers Electrical Co., and British Insulated Callender's Construction Co., put forward an unsuccessful tender for the electrification work.

German Exports

West German exports of electrical goods rose by 440 million marks to 1,710 million marks last year, the Manufacturers' Association at Frankfurt reports. The share of electrical goods exports in total West German exports was 7·78%, compared with 6·86% in 1953. Higher exports of all kinds of electrical goods contributed to the rise, the Association states, with electrical machinery exports worth 371 million marks representing the largest group. Europe was the industry's main export outlet. European countries bought 1,120 million marks' worth of electrical goods—32% more than in 1953. Sales to non-European buyers rose by 40% to 590 million marks. South American countries, primarily the Argentine, Brazil and Venezuela, were the best non-European customers.

S.W. ASIA

"New" H.E. Scheme for Tibet

Lhasa, the capital of Tibet, is to have its first hydro-electric power station under plans drawn up by Chinese engineers, as part of a Chinese Government scheme to improve the nation's economy, it is reported. This first hydro-electric project will utilise the waters of the Kyitchu River, but Chinese technicians are also to study the possibility of harnessing the Brahmaputra River for another station probably at Shigatse. Pending the erection of the latter station, a small thermal plant will be established there. Up to the present time the only power plant in Tibet has been a small station on a tributary of the Kyitchu. It seems more than likely that this "new" hydro-electric scheme is probably the same one for which the Kendal firm of Gilbert Gilkes and Gordon Ltd. supplied three 125 kW sets some time ago. Payment difficulties

delayed the shipment of those complete units for some time, but these have now been overcome, we understand. The order for those sets, originally given by the Tibetan Government, resulted from an enquiry for the equipment from Mr R. N. Fox of the British Political Mission in Lhasa, in Aug., 1946. Each unit consisted of a Gilkes Francis turbine controlled by an oil pressure governor driving a horizontal shaft alternator through a speed increasing gearbox. The sets were special split and packed, for it was the intention of the Tibetan government to have teams of up to 60 men carrying the equipment on bamboo poles on their shoulders. Now that the Chinese Forces have built an airstrip at Lhasa, perhaps that method of transport has been used.

Steel and Power Contract

The Pakistan Industrial Development Corporation has concluded an agreement with the German firm of Krupps for the setting up of a pilot steel plant and a new power station. Both are to be situated at Kot Addu in the Muzaffargarh. The agreement is for a period of ten years, with Krupps having a 10% share both in investment and profits. The Kot Addu power station, estimated to cost 30 crores, is expected to be completed in three stages, and will operate on Sui natural gas. The first stage consists of laying a pipeline from Sui to Kot Addu, the second being the establishment of the power station, and the third the erection of transmission lines from Kot Addu to districts in the lower Punjab. The steel plant will have a capacity of 50,000 tons annually, with later expansion to 300,000 tons.

AUSTRALIA

Wood Burners

Plans for extensions at Mount Gambier have been announced by the Electricity Trust of South Australia. A power station is now under construction there, adjacent to a timber mill, in which the initial installation will be two 3,250 kW Stal turbo-alternators. The Riley Dodds boilers will be fired with timber off-cuts, sawdust and shavings, but provision is being made for oil burning. This station to supply the timber mill, the township and more distant parts of the south-east, is scheduled for operation in 1956. Mr F. C. Drew, chairman of the Trust, has now stated that investigations had shown that early action would be needed to expand the station. It was now proposed to call for tenders for two 5,000 kW turbo-alternators with associated boiler plant, the first of which should be in commission in the first half of 1957. Plans were already in hand for erecting transmission and distribution lines, and these would be extended later.

Tennyson Opening

The first section of the Tennyson power station, is to be officially inaugurated on 26 Mar., by the Premier of Queensland, Mr Gair. This station of Brisbane City Council will only have one 30 MW set running initially, but a second machine is scheduled for commissioning later this year to complete the first stage of the project. The 10,000 kW "packaged" plant installed by the council at Tennyson as an emergency measure some time ago, is to continue in operation.

NEW ZEALAND

Power Protest

A protest against the likely postponement of the Braeburn hydro-electric power scheme in favour of a 220 kV line from Islington to Nelson, drawing power from the South Island grid with the first phase of generation at Roxburgh, has been made by a deputation from the South Island Local Bodies' Association to the New Zealand Minister of Works, Mr W. S. Goosman. At the recent meeting the executive committee decided to ask for the early ordering of the complete set of generators for Roxburgh, although one member ventured the opinion that by 1961, when the eight sets were operating, they would still be in the throes of a power shortage.

Head Office

A new administrative building for the Hutt Valley Electric Power Board, N.Z., has been officially opened by the Mayor of Lower Hutt, Mr P. Dowse. The building has two storeys, with an area of 13,000 sq ft, but has foundations to carry two more floors. At the opening ceremony, Mr Dowse said that since 1922, when the Board was formed, the number of consumers had increased to 30,000, 51% of power users in the Board's area were householders, and the undertaking had an annual turnover of £900,000.

EXPANSION IN BERMUDA

Famed as an all-the-year-round holiday centre, Bermuda has practically no local industry, but the sole electric utility in the Islands, the Bermuda Electric Light Co., which has operated there for the past 47 years, has successfully developed its residential and commercial load. Its yearly generation now exceeds 49 million units, and Mr W. E. Spurling, M.AMER.I.E.E., ASSOC.I.E.E., *secretary and general manager, tells us that the company is contemplating installing a further diesel generating set of approx. 5,100 b.h.p., which should take care of the demand for awhile. Bermuda, by the way, has just had its coldest winter since 1891, and on 4 Feb. last the undertaking recorded a maximum peak load of 11,800 kW—1,500 kW more than in 1954—due to the extremely cold weather and, presumably, the use of space heaters. We illustrate below, the company's power house, in which is installed ten diesel engine sets with an aggregate nameplate rating of 17,250 kW, but due to a temporary abnormal back log of major maintenance work these are de-rated to 13,500 kW. Eight of the sets are English Electric Fullagar machines, the first three being installed in 1925, and the last, a 2,000 kW set, in 1950. The other two sets are by Nordberg Manufacturing Co., U.S.A., design rated at 2,250 kW and 3,000 kW, which were installed in 1939 and 1950 respectively. All the engines in the generating station are of the two-stroke cycle design. Generation is at 2,300 V, and distribution at 115/230 V a.c. With the only supply of fresh water being dependent upon rainfall, the medium for cooling the fresh circulating water in the engines is by brackish water pumped from nearby wells, but it is intended that future generating sets should be provided with fin fan cooling equipment. In addition to Mr Spurling, the other members of the company's executive staff are: Mr G. A. Mountain,* B.SC., A.C.G.I., A.M.I.E.E., *electrical engineer and deputy manager, and Mr W. H. Allen,* A.M.I.MECH.E., M.I.I.E., *production engineer*

Personalities

IN THE INDUSTRY

Aberdare Cables Ltd. announce the appointment to their board of directors of **Mr H. A. Lamb,** general manager, **Mr R. H. Newton** and **Mr W. R. Hall,** export manager. Following the retirement of Mr H. de C. Falle, **Mr C. A. Hutchinson** will deal with home sales at the company's London office at 19 Woburn Place, W.C.1.

Mr J. E. Wright, ASSOC.I.E.E., has been appointed deputy superintendent at Barton power station, North West, Merseyside and North Wales Division, B.E.A., and takes over his new duties on 1 Apr. Mr Wright, who is at present shift charge engineer at Barton, became articled to the chief engineer of Bridlington Corporation Electricity Dept. during his apprenticeship and in 1924 he joined the Manchester undertaking where he held various positions at Stuart Street and Barton power stations.

Mr A. J. MacLeod, export manager of Lancashire Dynamo and Crypto Ltd., left London by air last week for an extensive two months' tour of the company's agents in the Middle East, visiting Egypt, Iraq, Lebanon, Syria, Jordan, Turkey, Greece, and Cyprus.

Retiring in May from the position of commercial officer for No. 3 sub-area of the Southern Electricity Board, **Mr A. H. Watson,** M.B.E., has completed over 46 years' service in the Supply Industry. He is being succeeded by **Mr W. K. N. Sandom,** now appointed sub-area commercial officer (designate). Mr Watson started with the Pangbourne Electric Supply Co., in 1908, and then became an articled pupil with the Reading Electric Supply Co. Following war service, he joined the Portsmouth Corporation undertaking in 1920 as mains assistant, and in 1923 was appointed consumers' engineer, a position he held till vesting day when he became the sub-area commercial officer. His successor, Mr Sandom has been senior assistant commercial engineer (tariffs and statistics) at the board's Bournemouth sub-area. He entered the industry in 1927 with the Metropolitan Electric Supply Co., remaining with them until vesting day when he held the position of area superintendent. Afterwards he was assistant sub-area commercial officer (tariffs and statistics) at the Bournemouth sub-area.

Mr A. N. E. McHaffie and **Dr J. N. Aldington** have joined the board of directors of Siemens Brothers and Co., Ltd. **Sir Hugh Warren** has ceased to be director. Mr McHaffie is the group managing director of the Ediswan-Hotpoint group of Associated Electrical Industries Ltd. Dr Aldington is the managing director of Siemens Electric Lamps and Supplies Ltd., and also of Alfred Graham and Co. Ltd.

Due to retire at the end of July from the position of district manager at Melksham to the Southern Electricity Board, is **Mr F. T. Bushroyd.** To fill the vacancy, **Mr H. F. Brewer,** ASSOC.I.E.E., will transfer from a similar position at Newbury, with effect from 1 Aug.

General manager of Pirelli-General Cable and Works Ltd., since 1940, **Mr W. W. Wood,** A.M.INST.C.E., M.I.E.E., has retired from that position but remains a director of the company. His successor is **Mr J. R. Harding,** B.SC.(ENG.)., M.I.E.E., previously assistant general manager. Mr Wood was educated at Marlborough College, served an apprenticeship with John Fowler and Co. of Leeds, and studied mechanical and electrical engineering at the Yorkshire College, Leeds. After two years with the British Electric Plant Co. of Alloa, and ten years with Ernest Scott and Mountain of Newcastle-on-Tyne, he was appointed a technical sales engineer at the Witton works of the G.E.C., and eventually became manager of Witton Engineering Sales. In 1924 he rejoined Mr Mountain in his consulting practice and became managing director of H. H. Vivian and Co., Ltd., in Birmingham. Nine years later he was appointed manager of the Switchgear and Instrument Department of the G.E.C., and in 1936 assistant to Mr Maurice Solomon for his work in the Cable Makers' Association on behalf of the Pirelli-General Cable Works Ltd. Mr. Harding, hitherto assistant general manager, has previously occupied the positions of manager of the Overhead Lines Department, deputy manager of the Rubber Cable Sales Department, and joint manager of Paper Cable Sales Department. He received his technical education at University College, London, and was a college apprentice with the Metropolitan-Vickers Electrical Co., Ltd.

Mr J. Palmer Rees, A.M.I.E.E., of White Lodge, Ogmore-by-Sea, Glamorgan, has been appointed local South Wales representative for the land products of Richardsons Westgarth (Hartlepool) Ltd. Mr Rees retired from the position of superintendent of Llynfi power station, at the end of June last, after completing 47 years' service.

Mr J. W. Johnson, B.ENG.(LIVERPOOL), deputy station superintendent at Bromborough, North West, Merseyside and North Wales Division, B.E.A., since 1950 has been promoted to station superintendent there. Before going to Bromborough, Mr Johnson was assistant boiler house superintendent at Clarence Dock for three years, where he also served as shift charge engineer and senior charge engineer.

Mr W. Charles Waghorn, general manager of Insulation Ltd., has been elected president of the British Plastics Federation, in succession to Mr C. F. Merriam. Mr Waghorn was the first chairman of the Federation in 1933. **Mr A. E. Skan,** director of Tufnol Ltd., has been re-elected chairman of the Federation, with **Mr C. C. Last,** director and joint general manager of Bakelite Ltd., as vice-chairman.

Mr A. E. Barton, managing director of Bryce Ltd. and its wholly-owned subsidiary, Siemens-Schuckert (Gt. Britain) Ltd., has been appointed an additional director of Hackbridge Cable Holdings Ltd., following the acquisition by the latter concern of the whole of the share capital of the two former concerns (as we note on page 510).

Mr D. T. Barritt, a joint managing director of Simon-Carves Ltd., has been asked to join the Government mission which will leave for India in April at the request of the Indian Government to spend three or four weeks preparing recommendations on the building of a

Mr A. H. Watson

Mr W. W. Wood

Mr J. R. Harding

Mr J. Parr-Morley

Mr J. D. Mosley

Mr A. G. F. Farquhar

new Indian steelworks. Mr Barritt will be the expert adviser on the mission on coke oven construction.

The president of the Electrical Power Engineers' Association for 1955/56 is **Mr John Parr-Morley,** construction engineer in the Northern sub-area of the London Electricity Board. Educated at Malvern College, King's College, Regent Street Polytechnic, Mr Parr-Morley had a varied engineering experience before attaining his pre-nationalisation position of mains engineer to the Hackney Borough Council Electricity undertaking. For some years now Mr Parr-Morley has been active in the municipal and political life of his district; he is a member of the Wanstead and Woodford Borough Council and chairman of many committees. In the work of the E.P.E.A. he is particularly renowned for his services to the London Technical Group of which he was secretary for over 25 years. In addition to his membership of the National Executive Council he also serves on the No. 1 District Joint Board, the National Joint Board and the National Joint Advisory Council for the Electricity Supply Industry. He will be an E.P.E.A. delegate to the Trades Union Congress.

Now with the Eastern Electricity Board at Chelmsford, **Mr A. Kennedy** is joining the South Western Electricity Board on 1 May as second assistant constructional engineer in the Bridgwater district.

Mr D. F. Pickering, A.M.I.MECH.E., has been appointed assistant sales manager of J. and H. McLaren Ltd. Before joining that concern he was sales and contracts engineer with the English Electric Co., Ltd., at Rugby. McLaren's also announce that **Mr E. Robinson** and **Mr J. Mackie** are now operating as sales representatives in the north-west England area and in south Scotland respectively.

The Television Society has awarded the following Premiums, value £5 each for outstanding papers read before the London meetings in 1954: The "Electronic Engineering" Premium: to **Dr G. N. Patchett** of Bradford Technical College, for his paper on "Problems of Interlacing"; The Mullard Premium: to Messrs **G. B. Townsend, E. Ribchester,** and **D. Bauer** (G.E.C.) for their paper on "An Investigation of the 625-line C.C.I.R. System"; The E.M.I. Premium: to Messrs **R. J. Boddy** and **C. D. Gardner** (E.M.I. Research Dept.) for their paper on "An Industrial Television Channel"; and a special Premium by the Society to **Mr G. C. Gouriet** (B.B.C. Research Dept.) for his papers on "Colour Television."

Formerly assistant secretary in the Electricity Division of the Ministry of Fuel and Power, **Mr A. G. F. Farquhar,** O.B.E., COMP.I.E.E., has been appointed deputy secretary to the British Electricity Authority. After early experience in banking, Mr Farquhar studied at the London School of Economics and, at the age of 21, passed into the Indian Civil Service. During his career in India he organised Civil Defence in the Central Provinces in the last world war. He subsequently became a secretary for commerce, industry and local self-government to the Central Provinces Government. During this time, he was responsible for the post-war electricity development plan of that province. He later became chairman of the Nagpur Improvement Trust. Leaving India in 1947, he joined the Ministry of Fuel and Power in the same year as a Principal, working in the Electricity Division and remaining in the Division when he was promoted to assistant secretary in 1948. In 1954 he went to Nigeria at the invitation of the Electricity Corporation of Nigeria to report on their general policy and organisation. Mr Farquhar was awarded the O.B.E. in 1942 and was recently elected a Companion of the I.E.E.

Among those upon whom Fellowship of the Council of the City and Guilds of London Institute has been conferred in recognition of the contributions to the advancement of the industry are **Mr A. M. Mooney,** C.B.E., A.C.G.I., M.I.E.E., deputy director of electrical engineering, Admiralty, and **Mr C. W. Speirs,** J.P., M.I.E.E., F.INST.P., formerly with the Morgan Crucible Co., Ltd. Mr Mooney served an apprenticeship with the Metropolitan-Vickers Electrical Co., after war service, and following outside erection work with that firm, joined the Admiralty in 1927. He has served in H.M. Dockyards at home and in Ceylon and Singapore. On returning to this country in 1938, he was promoted to superintending electrical engineer in the Electrical Engineering Dept., Admiralty, then assistant director in 1944, and to deputy director in 1951. Mr Speirs, who has retired, was a pupil with C. A. Parsons and Co. before entering the City and Guilds. Following a period with Waterlow and Sons, where he modernised their copper plating department, he joined the Morgan Crucible Co. in 1898. There his inventive genius resulted in many patents which pioneered the application of carbon in the electrical industry. He was also one of the first to install turbines in a factory.

Among persons of distinction who receive Special Awards from the Council of the City and Guilds of London Institute, is **Mr J. A. Mason,** M.M., M.I.E.E., M.I.I.A., who has been manager of the Automatic Telephone and Electric Co., Ltd., in charge of the local organisation in Liverpool, since 1946. He is also a director of the company which he first joined in 1911.

Mr M. D. Heaton has been appointed a director of Adamson Green and Co., Ltd. Until his resignation at the end of February, Mr Heaton was for five years general manager of Fairless Engineering Supplies Co., Ltd., and previously was electrical manager of Blyth Dry Docks and Shipbuilding Co. Mr Heaton will be jointly responsible with Mr J. G. Adamson, Jnr., for the development and production at the Felling Works.

Mr V. H. E. Evans, A.C.A., has been appointed chief accountant of the South Wales Electricity Board as from 1 Aug. He succeeds **Mr S. R. Butler** who, as we have already noted, is taking the 10th. Mr Evans has held a senior position in the Board's headquarters accountancy staff since 1948.

Regarding our note last week concerning **Mr T. Counter** joining B.E.A.M.A., it should be made clear that he is secretary of the Domestic Appliance Section and of the Domestic Cooker Section.

Mr G. M. Wells and **Mr I. G. Hopkinson** have been appointed directors of Hopkinsons Ltd. Mr Wells has been London manager since 1939, and Mr Hopkinson Works manager since 1947.

Mr J. D. Mosley, B.SC.(ENG.), A.M.I.E.E., of Metropolitan-Vickers Electrical Co., Ltd., is now the company's district erection engineer for London. After technical education at Brighton Technical College, Mr Mosley went to M-V as a college apprentice in 1935. On completing his course he joined the Erection Department and was later appointed a supervising engineer.

Previously with the Telephone Manufacturing Co., Ltd., **Mr L. Kearton Parker** has joined Winston Electronics Ltd. as chief sales engineer.

OBITUARY

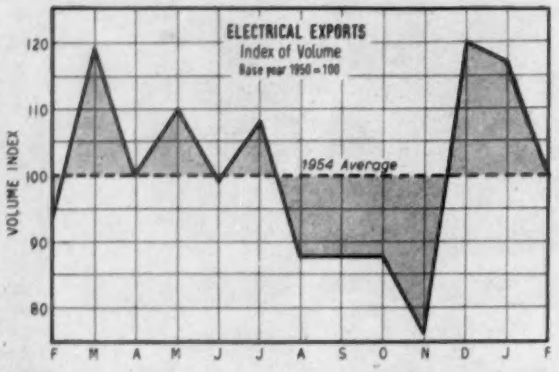
Mr T. Robson, of North Shields, the oldest surviving member of the Tyne Electrical Engineers, has died, aged 84.

Mr A. V. Robinson, works manager to E. Green and Sons Ltd., Wakefield, died on 17 Mar.

Mr J. G. Milligan, who represented Kent Bros. Electric Wire Co. and E. H. Phillips Ltd. in Manchester for over 30 years, died on 18 Mar.

EXPORTS and IMPORTS

Statistics for February



THE considerable fall in the volume of electrical exports during February can be considered as only a return to normal after the somewhat abnormal conditions prevailing in December and January. As can be seen from the ELECTRICAL TIMES index of volume, the actual level of exports for the month compares favourably with previous months, particularly when it is remembered that February is a short month. The index itself fell to 100 for the month, compared with 96 for the corresponding month last year, and the average of 100 for 1954, all indexes being based on 1950 as 100. Discounting January and December, the February figure is the best since July last year.

In value, exports of electrical machinery goods and apparatus totalled £14,543,752. As in previous months, this figure is the total for items listed under Division 16, Class D of the official accounts and does not take in domestic refrigerators and washing machines. When these are added to the list, they give the total of £15,448,905 shown below.

Many categories of electrical goods record small increases compared with a year ago, particularly in the domestic appliance sphere. The most notable was probably that of refrigerators which more than doubled the figure for the corresponding month last year, and was over £25,000 up on January's amount. Exports of fans were also much higher—of the total for last month, the ceiling type alone accounted for £214,710 in value. Electric flat irons to a value of £69,549 were sent abroad in February, compared with £121,734 in January.

South Africa took the greatest value of our exports of generators last month, a figure of £309,838, Australia following with £264,703; but our best customer for all types of electrical goods was India, with a value of £1,583,000, South Africa following with £1,415,000.

Description	Exports Value (£)			Imports Value (£)	
	February 1953	February 1954	February 1955	February 1954	February 1955
Generating Sets:					
Diesel up to 200 kW	396,441	180,272	364,772		
„ over 200 kW	132,936	191,839	397,422		
i.c. driven	23,293	23,776	23,550		
Steam turbine-driven	26,988	2,756	215,886	28,764	27,203
with other prime movers	41,818	64,817	231,438		
Generators	106,277	274,023	174,304		
„ parts	108,456	543,287	411,459		
Motors	886,310	906,750	765,804	36,978	84,139
Motor starters and controllers	183,621	193,478	185,292		
Convertors and rectifiers	111,011	66,079	116,262		
Transformers	906,837	840,254	704,331	33,313	52,019
Switchgear and Switchboards	1,197,698	1,423,491	1,257,836		
Batteries, primary and parts	202,448	307,254	293,903		
Fluorescent and Discharge lamps	33,476	66,536	68,299		
Other lamps	90,281	92,397	131,146		
Radio and Electronic gear	1,349,988	1,706,404	1,990,711	637,318	816,602
Telephone and Telegraph Plant	1,271,838	1,408,852	1,204,705		
Cooking Appliances and parts	112,946	115,102	236,712		
Space heaters	27,498	37,355	44,314		
Water heaters	22,182	19,682	28,213		
Other heaters and parts	96,947	137,727	168,632		
Welding machinery	89,483	80,101	94,785	5,626	15,598
Signalling and Bell equipment	56,602	66,869	36,818		
Commercial Instruments	122,191	132,853	127,674	44,034	75,946
House Service Meters	67,892	106,842	112,611		
Electro-medical and X-ray apparatus	116,741	91,221	112,247	35,585	39,602
Fans	103,668	94,813	152,765		
Vacuum Cleaners	166,545	200,124	118,273		
Other Appliances and parts	144,868	381,008	342,187		
Portable power tools	136,301	141,555	187,795		
Washing Machines up to 150 lb	146,509	298,202	238,515		
Power Refrigerators, up to 12 cu ft	390,894	329,333	666,638		
Telephone and Telegraph Cables	750,319	351,194	561,013		
Paper-insulated Cables	1,076,415	449,916	568,059		
Rubber-insulated Cables	461,488	315,943	482,439	12,284	13,929
Winding and similar wires	160,230	100,388	126,567		
Other Cables and Wires	336,518	197,860	195,034		
Accumulators and parts	242,932	292,290	332,101		
Insulating Materials	90,905	109,110	168,022		
Electrical Ware	113,012	100,519	86,430		
All other articles	1,380,953	1,627,143	1,723,841	319,000	361,463
Total	13,861,127	14,072,415	15,448,905	1,142,902	1,486,501

PROBLEMS AND PRACTICE

In Engineering

Every engineer has a story to tell; why not tell yours on this page? We welcome contributions to this feature, and those published will be paid for at our standard rates. Problems which are encountered and overcome in day-to-day maintenance or installation of electrical plant; useful methods and techniques developed for specific jobs, or current practices, all make instructive reading for others. We will also consider for publication problems requiring an answer. Sketches are often helpful and need only be rough, as they will be redrawn before use.

Useful Pulley-Draw

THE small pulley drawing tool illustrated is designed to accommodate pulleys up to about 2½ in. diameter and for withdrawing them from the spindles of fractional h.p. motors. Easily constructed, the tool comprises a beam having two elongated slots in which are fitted the two hooked bolts. The hooks on the bolts bear on the back face of the pulley and spacing between them can be adjusted by setting them in slots in the beam. In the diagram is indicated the method used for making each hook bolt from a standard ⅜ in. square-headed bolt; surplus material on the head is sawn and filed away.

One unusual feature of the pulley-drawing tool is the anti-friction ball-thrust bearing incorporated in the pointed end of the screw. A cross-section of the ball-thrust is detailed in the sketch and consists of a hollow nose, of conical shape on the interior and hollowed internally. A hardened steel ball separates the end faces of the screw and the recess in the false nose. Both faces are hollowed out to provide seatings for the ball.

It will be noted that the conical end of the false nose is not taken to a sharp point, as this is unnecessary. The cone has to be machined accurately to an included angle of 60° so that it fits neatly the standard centre hole in the motor shaft end and does not distort it.

The provision of the ball thrust minimises damage to the shaft centre holes. In use, the false nose remains stationary whilst the screw is being turned. This ensures that the centre hole in the shaft end is not scored. This is an improvement on the standard type of pulley drawer which uses a point integral with the screw and must revolve with it; centre holes in shafts are usually scored and distorted by a revolving point and become useless for mounting the rotor on lathe centres.

The low friction of the ball thrust makes the pull-screw easier to turn under pressure. Pulley drawers often tend to revolve the motor shaft and must, therefore, be locked against turning. A ball thrust enables the pulley drawer to be held stationary by attaching a wrench to the end of the beam.

Existing pulley-drawer screws can be modified to take a ball thrust bearing by adopting the method illustrated. The false nose can be kept in place by means of two small-diameter pins which are driven into holes drilled tangentially through it. The pins engage with a circumferential groove machined in the screw end.—*C. T. Bower.*

Hole Cutter Improvement

IN a note on this page, published 25 Feb., 1954, M.N. describes a method of tightening the blade on that very popular item of the electrician's tool, the hole, or ring saw.

The method suggested binding the blade with eight turns of ·029 in. earth wire, and this certainly enables one to cut a more consistent hole and extends the life of the blade. Its only disadvantage is that the blade fixing screws get in the way to prevent a sound job being made, whilst the twisted ends of earth wire tend to break off.

The writer's method of overcoming this difficulty is to use a copper band, drilling two holes to let the blade fixing screws through. As copper water pipe is measured by inside diameter and electrical conduit by outside diameter, a short piece of the appropriate size copper pipe is all that is required for a perfectly fitting copper band.—*W. Satchwill.*

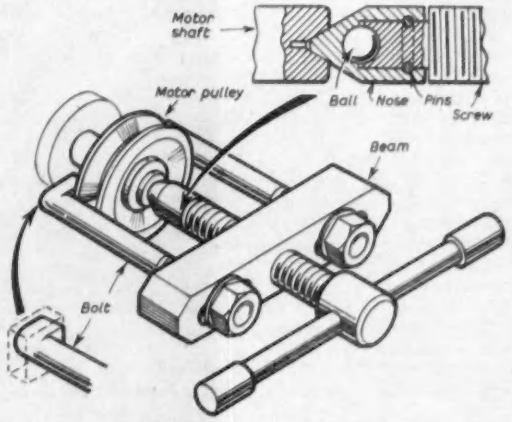


Diagram of the useful pulley draw, showing (inset, bottom) the method of making the hook bolt from a standard bolt, and (inset, top) a section of the ball thrust bearing in the top of the screw

Installation Earthing

I HAVE read with interest the observations made by readers W. T. Wedlake and J. H. Robinson in the 10 Mar. issue and am glad to know that I am not alone in advocating the earthing of installations at extremities.

I am, however, prompted by J. H. Robinson's note to make the following observations. I fail to see that it is more important (than earthing at extremities) to connect the e.c.c. from the "mains" position to the rising water-main although it is appreciated that this practice has the advantage of reinforcing the fault path to earth. This advantage is, however, lost when no earth electrode is available at the "mains" position.

Mr J. H. Robinson "hits the nail on the head" when he suggests that Regulation 4 of the I.E.E. regulations should be amended to read "must" *for* "should . . . . be periodically inspected. . . ." In my opinion Regulation 4 might well not exist in either form, and it is with this in mind that installations should be as safe as possible.—*R. H. G. Holloway.*

Oil Moves House

THE writer recollects a somewhat similar experience to that recounted by your correspondent N.S. in the 17 Mar. issue, but in this case the oil was leaving a welding transformer tank via flexible cable tails into the isolating switch fixed to the tank sides. Cutting back the cable sleeving to above oil level did not effect a complete cure as presumably the cable strands were so thoroughly soaked in oil that the spacers between the strands continued the capillary action. New flexible cable tails were eventually fitted, the strands being solidly soldered from the transformer connections to above oil level, which seemed to be the remedy for this particular spot of trouble.—*T. H. Snelson.*

Cleaning Conduit

OFTEN on a carcassing job, where conduit is left unwired for some time, it becomes partially blocked internally, due to the carelessness of building operations. Such obstructions can best be cleared by means of a length of old steel pull in tape, say two yards long, one end being placed in a hand brace, the other end being pushed through the conduit. If this end is sharpened to a point, the rotating motion given will cause it to clear away debris.—*W. E. W.*

Equipment for Industry

Stud/Arc Welding Set

A NEW transformer-rectifier unit introduced by CROMPTON PARKINSON LTD., Crompton House, Aldwych, W.C.2, in addition to being suitable for stud welding also provides facilities for manual arc welding. Three outputs allow for welding up to ½ in. diameter studs, single arc welding up to a maximum of 400 A, or two independent welding operations taking up to 200 A each

The power source is provided by a 3-phase air cooled transformer operating in conjunction with two banks of selenium rectifiers which operate singly or in parallel according to the output selector switch position. To provide for fine control of the welding-arc current, magnetic amplifiers are employed, and these are operated in conjunction with variable rheostats under direct control of the operator at the point of welding.

A totally enclosed fan ensures that all components are maintained at a safe working temperature. In the event of fan-motor failure, a centrifugal switch controls the welding current output to a safe value. Provision for easy starting takes the form of a "hot-start" feature which gives 25% current increase at the instant of switching-on.

All components are housed in a substantial metal case and the unit is said to be suitable for operation in arctic or tropical conditions. The case measures 4 ft high by 3 ft 10 in. deep by 2 ft ½ in. wide and weighs 11¼ cwt.

Crompton's have made this latest machine suitable for both stud and arc welding

Key Operated Switches

ALTHOUGH for many years locking facilities have been available on distribution switchgear, it is only recently that this provision has been made on light current gear. With their latest range, CRATER PRODUCTS LTD., The Lye, St. Johns, Woking, Surrey, have embodied barrel type key operated mechanisms in their rotary switches, which are normally used for control circuits. This innovation has been introduced as a result of the increasing importance that is being paid to safety in electrical installations.

These rotary switches have key operated mechanisms. A large number of different key sequences are available

A large number of different key sequences are available, provision being made for keys to be trapped in "on" or "off" positions to suit customers' requirements.

Lighter Batteries for Short-time Duty

IN power stations and substations there are many applications where batteries are employed for standby purposes. TUDOR ACCUMULATOR CO., LTD., 137 Victoria St, S.W.1, have for some time been considering the possibility of manufacturing short-time rated equipment, and, with the co-operation of the British Electrical Authority, they have developed a new range. These lead acid batteries, although of a lighter construction than standard types, and not suitable for operation on continuous cycles of charge and discharge, are said to have retained the inherent advantages of long life and negligible maintenance. Having a lower internal resistance, the new type of cell is said also to provide an improved high rate performance, enabling a lower nominal capacity battery to be installed for a given requirement. This advantage is most apparent when high rate requirements, such as switch closing, predominate. However, even with low rate requirements, such as emergency lighting, some saving is said to be achieved. In any case a considerable saving in space is said to result from the installation of these new lighter constructed cells.

The elements comprise 5/16 in. thick Planté positive plates suspended by lugs from integral ridges in the moulded glass box, and pasted grid negative plates 3/16 in. thick. These latter plates are supported at the base on moulded ebonite shoes, which also locate ribbed "Porvic" separators. The elements are held in position in the glass box by plastic springs or buffers, and a flush-fitting loose lid is provided. To prevent acid seepage a rubber ring is fitted round the flanged skirt of the lid. Five standard sizes of cell are made, these range from the HPB.9, having a capacity of 100 Ah, to the 300 Ah type HPB.25.

Flameproof Traction Motors

IN their latest traction motor, SMALL ELECTRIC MOTORS LTD., Beckenham, Kent, have retained the design features employed in their standard range but have, in addition, made them flameproof to permit their use on battery operated vehicles destined for mines or chemical works. Buxton certified for use in atmospheres containing group II gases, these motors employ Class "B" installation throughout and prior to dispatch are fully tested to B.S.173.

The frame, of high permeability cast steel, supports the pole pieces which consist of laminations riveted under pressure. Field coils are wound with asbestos covered high-conductivity copper treated with a special insulating varnish. The laminated core assembly is pressed and keyed on to the main shaft which is supported by ball bearings housed in the end frames. Cast steel is employed for the driving end frame but at the commutator end, to provide greater strength, spheroidal graphite has been used. This material is also used for the terminal box. Commutator and brushgear follow conventional design, provision being made for adjustment of spring pressure to compensate for brush wear.

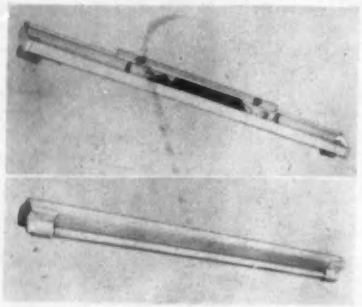
A flameproof cable-gland, of the firm's design, is usually provided on the terminal box, but this may be varied to suit customers' individual needs. The shaft extension from the motor is arranged to take a key and coupling, but in this instance also the firm are prepared to offer other than standard arrangements. At present the motors are being made in sizes ranging from 1½ to 3 h.p.

These flameproof traction motors have been fully approved for Group II gases

Crompton "Ceiline" Fitting

THE "Ceiline" range of fluorescent fittings has been introduced by CROMPTON PARKINSON LTD., Crompton Hse, Aldwych, W.C.2, to meet a demand for a low-priced but high-quality unit specially designed for close to ceiling mounting.

Easy installation and servicing features worthy of note are the simple fixing arrangements suitable for all forms of sunken or surface wiring, positive earthing and earth continuity facilities, die-cast end plates with knock-outs for surface conduits, and a readily accessible patent visible action starter switch. Another feature enables the unit to be temporarily



Crompton's "Ceiline" fittings are designed for close to ceiling mounting

suspended from the two ceiling catches at an angle that permits ready accessibility to the lapped high power-factor control gear for connection purposes. When the wiring has been completed the fitting is slung into its correct position and then drawn up close to the ceiling by the simple adjustment of two knurled nuts.

Spring loaded lampholders at each end permit easy insertion of the tubes, these lampholders being protected by sliding self-retaining plastic lamp end shields. Finished in "Permawhite" enamel on a "bonderised" base the fitting weighs 17 lb. Either switch start or snap start gear is supplied.

New Sodium Ballast by Philips

A NEW type of ballast specially designed to meet the particular requirements of sodium street lighting is now being marketed by PHILIPS ELECTRICAL LTD., Century Hse, Shaftesbury Ave, W.C.2.

The new ballast measures 8½ x 4½ x 4½ in. and is thus particularly suitable for installation in the base cavities of street-lighting columns. Despite its compact size, the ballast has marked resistance to corrosion and easy accessibility of terminals.

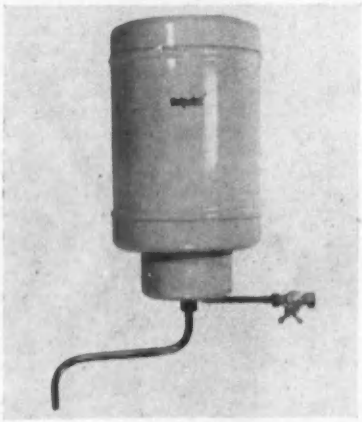
The transformer is designed to operate over a range of 190/260 V and is contained in a pressure die-cast case of silicon aluminium finished in black stove enamel and is filled with a hard setting compound specially selected for its stability at high ambient temperatures. The internal assembly is thus completely waterproof.

Coils are symmetrically wound, this reduces radio interference to a minimum. Prices are L3620 (for 45 W, 60 W, 85 W lamps), £5. 15s. 4d., and type L3644 for 140 W lamp at £6. 16s. 4d.

Hotpoint 1½-Gallon Storage Heater

THE stylish storage water heater model NA2A introduced by the HOTPOINT ELECTRIC APPLIANCE CO., LTD., Crown House, Aldwych, W.C.2, has an ample storage capacity of 1½ gallons and maintains a supply of really hot water for all exigencies.

The inner container is copper tinned against corrosion and tested to 40 lb sq in. pressure. The heater is fitted with a restrictor valve to give correct flow and is suitable for direct connection to the cold water mains. Elements are "Torribar" pure heat elements of sheathed wire type controlled by thermostat and loaded at 750 W for a.c. mains 200/220 V; 230/250 V supplies. Insulation material is packed between inner container and rust-proofed steel outer casing which is finished in hard cream enamel. Chromium-plated swivel swan-neck outlet with anti-drip and anti-splash device is provided with a cold water inlet pipe complete with tap for left- or right-hand connection to the cold water supply.



Hotpoint's heater—a stylish asset to the home

Price Reductions

LOWER production costs reflected, say EASCO ELECTRICAL (HOLDINGS) LTD., Brighton Terrace, S.W.9, on their greater output of Rectostat battery chargers to overseas markets have enabled the firm to pass on to home market customers the following reduction in list price of two popular models.

The type D.27 1 amp charger has been reduced 10s. to £3. 5s. whilst the type D.20A 2½ amp charger has been reduced by 5s. to £5. 10s. Both reductions were effective from 15 Mar., 1955.

Improved Fluorescent Efficiencies

AS a result of improving performance during the last twelve months revised efficiencies for all sizes of WHITE 3500° K and DAYLIGHT fluorescent tubes are announced by the Atlas Lighting Division of THORN ELECTRICAL INDUSTRIES LTD., 105 Judd St, W.C.1, and

For the Electrical Trade

EKCO-ENSIGN ELECTRIC LTD., 45 Essex St, Strand, W.C.2.

The increases vary between 5% and 12½%. The 80 W WHITE tube now has an average light output through five thousand hours life of 4,160 lumens and the DAYLIGHT tube 3.920 lumens.

Chilton Hair Clipper

ON display at the Electrical Engineers Exhibition was the new electric hair clipper introduced by CHILTON ELECTRIC PRODUCTS LTD., Hungerford, Berkshire, of Buk and Kub dry shaver fame and in a different field makers of Atlas and Chilton miniature circuit-breakers.

This new clipper is available in five different colour schemes: black plastic exterior with red switch, cream and black, grey and black, red and black, and all cream. It sells at £5. 5s. retail and includes flexible cable and plug packed in a neat container. A sliding switch gives instant finger-tip control. The clipper has a plastic comb attachment with metal teeth which enables the user to simulate the professional scissors and comb method of trimming and shaping whilst the clipper itself is for fine clipping and edging. For a.c. supplies, 200/250 V the Clipper is covered by a year's guarantee.

Latest model by Chilton is this electric clipper

NEWS OF THE WEEK

Fourth A.S.E.E. Exhibition Breaks Records

But leaves some weighty problems for next year

WITH new records for attendance and business activity as highlights of its five-day run, the fourth annual Electrical Engineers' Exhibition came to a successful finish on Saturday with nearly 52,000 visitors having passed through the turnstiles. In both aspects, the Exhibition will have undoubtedly exceeded results of any earlier show of similar character, whilst the attendance particularly was almost double the 28,000 recorded for 1954. By how far the Exhibition has progressed is indicated by the attendance of 13,476 on Saturday alone, which almost equals the total attendance, 14,364, for the whole of the 1953 Exhibition. On the other hand, by how much business activity last week topped previous figures it is difficult to judge, but few of the 240 odd exhibitors will have come away dissatisfied.

Looking at the figures in greater detail, it is seen that the "peak hour" was between 2 and 3 p.m. on Saturday, when 3,600 visitors were recorded. On Friday afternoon, entrances exceeded 2,000/hr. for two hours. Among Saturday's visitors were parties of students, and, in fact, organised parties from works and other establishments were conspicuous throughout the week, adding emphasis to the educational nature of the Exhibition. From overseas, support was no less encouraging, the attendance of some 113 visitors being recorded. The largest party, of 31 engineers, came from France, with Australia, Ireland and New Zealand as runners up. In all, 32 countries were represented, from all parts of the world except South America.

What of the future? Despite satisfaction with results so far, many exhibitors were concerned with next year's show and the forthcoming meeting at Caxton Hall, on Monday, 18 Apr., at 11 a.m., will provide the suitable opportunity for such views. One of the biggest question to be placed before representatives at that meeting will be that of extending the size of the Exhibition. Undoubtedly, if the show continues its expansion at the present rate, it will be forced to extend on to the First Floor of Earls Court, which has the immediate disadvantage of increasing costs of lighting and other factors. Moreover, it has been felt by many that the Exhibition at its present size is at its most convenient, enabling visitors to encompass it in a single day. It is, after all, not uncommon for trade shows to restrict their size, and, correspondingly, draw up a waiting list of new firms wishing to participate. On the other hand, if the Exhibition is to become more representative of the industry as a whole, as some would wish, it will obviously have to expand considerably further.

Whether expanded ot not, consideration will also have to be given to the possibility of extending the time the Exhibition remains open beyond its present five days. Another factor is that of greater time for erecting the exhibition, whilst, of course, the venue and date of the next exhibition will have to be formally considered. It is here that exhibitors may wish to introduce the question of the Exhibition's relations with the electrical section of the B.I.F., which, as was recently announced, may move to London. At all events, Earl's Court has been reserved, not only for the customary period in March, but also provisionally, during May. Moreover, some exhibitors may suggest that space be balloted for next year.

Since it is current practice for the Exhibition also to have a special feature from year to year, the 1956 theme will also have to be fixed. The predominant suggestion, it has been hinted, is space heating and air conditioning, although transformers and traction have their special claims. Additional provision for overseas visitors is another question to be discussed, to arrange, it is hoped, organised entertaining and works visits.

Hackbridge Acquire Capital of Bryce and Siemens-Schuckert

WHOLE share capital of Bryce Ltd. which includes the wholly owned subsidiary, Siemens-Schuckert (Great Britain) Ltd., has been acquired for cash by Hackbridge Cable Holdings Ltd. The managing director of these companies, Mr A. E. Barton, has been appointed an additional director of Hackbridge.

Technical Training Scheme for N. Rhodesia Copperbelt

A £400,000 foundation to promote technical education on the copperbelt has been established by the four producing copper mining companies in Northern Rhodesia, Mufulira, Nchanga Consolidated, Roan Antelope and Rhokana Corporation are the contributing companies who each have a quarter share.

The foundation under the control of a board of governors—including representatives of the Federal Government, the Northern Rhodesia Government, certain employee organisations of the mines and the donor companies, will first aim to establish a technical college with a central headquarters and it is presumed various branches at the mines. Educational facilities will be available to all whose educational qualifications enable them to take advantage of them. University and other higher education will come within the purview of the foundation which will be empowered to devote its funds to other purposes appropriate to its general objective, i.e., the provision of improved standards of education particularly in the technical field for the European community of the copperbelt.

Australia tightens Import Controls

A DEFICIT in Australia's balance of external trade and payments during the current financial year has necessitated a further tightening of the country's import controls. The new regulations announced by acting Prime Minister, Sir Arthur Fadden, on Monday come into force on 1 Apr. Quotas in the main category of goods will be reduced by 15% and less essential goods by one third. The main category of goods, known as class A is the largest and the 15% reduction has been made by placing them on a basis of 85% of the last year (1950-51) instead of 100% fixed last October. The 100% basis replaced the "no quantitative restriction" brought into operation this time last year. Reduction in quotas for less essential goods has been achieved by a cut in class B commodities from 60% to 40% of base year imports. Articles in this class include most electrical domestic appliances.

As there is an average time lag of six months between the issue of a licence and actual import of goods the effect will not be felt until about August when the new financial year was well advanced. It is estimated that these restrictions, together with those imposed in October, will result in a total drop in imports of about £A110 million during 1955-56. At their new level, imports will still be a good deal higher than under the drastic restrictions imposed in 1952. Sir Arthur emphasised it was still the Government's intention to reduce and finally eliminate all import restrictions as soon as possible.

GOOD DECEMBER TV/RADIO SALES

RADIO and television sales again were at a high level in December last year, according to figures issued by the Radio and Television Retailers' Association.

Television sales were below the record November figure but averaging 20·84 sets per shop were good. Radio sales on the other hand were the highest since December 1950 at 18·09 sets per shop.

In tabular form the figures are:

	Average No. of sets sold per shop	
	1954	1953
Radio:		
November ...	14·68	10·07
December ...	18·09	14·31
Television:		
November ...	22·19	16·0
December ...	20·84	15·73

Figures issued by the R.T.R.A. show percentage of sets sold on hire purchase. A slight drop from 53·9% (November) to 50·67% is noted for December radio sales. Comparable 1953 figures also reflected a drop in demand for hire purchase sales from 41·93% to 41·6%. Hire purchase transactions, however, formed a slightly larger percentage of television sales in December at 63·73% against November figure of 62·85%. In 1953 this trend was reversed there being a drop in December of 2·05%.

Saturday Opening of Showrooms

THE question of opening Electricity Board showrooms on a Saturday afternoon was again discussed at last week's meeting of the Southern Consultative Council. New and recent figures were given and as a result it was agreed to seek fresh opinions from members. Consequently a motion to rescind a previous request to the Board to carry out experimental Saturday afternoon opening was approved.

U.S. Gas Turbine to be Built in U.K.

TO MANUFACTURE the American Mars 40/60 h.p. gas turbine under licence in this country a new £150,000 company has been formed. Sugg Solar Ltd. has been formed as a subsidiary of Wm. Sugg and Co., Ltd., the gas engineering firm with the Solar Aircraft Co. of San Diego, California, as a shareholder.

The new company will have licence rights in the U.K., Europe and Commonwealth countries with the exception of Canada covering all present applications of the Mars engine and future developments. This small gas turbine plant develops up to 60 h.p. at 40,000 r.p.m. running on natural gas, diesel oil, jet fuel or high octane petrol and can be used *inter alia* as an airborne auxiliary power unit, a ground power unit for starting jet engines, as a prime mover for generators or a power source for electronic equipment.

Commons Committee to Watch Nationalised Industries

NATIONALISED industries, including the electricity boards, will now be liable to investigation by a new Parliamentary body, a House of Commons Select Committee which was set up last week. Formation of such a committee was recommended by another committee which in 1953 suggested how Parliament might be kept better informed about the activities and problems of the nationalised industries, having regard to the need to avoid interference with their management.

There are to be 13 members of the committee, and those initially appointed are Lord Hinchingbrooke, Sir Ian Horobin, Miss Florence Horsbrugh, Mr J. Hutchinson, Mr Ramsden and Sir Patrick Spens (Conservatives); Mr Renton (Nat. Lib. and Conservative); Messrs. Albu, E. Davies, Noel-Baker, A. M. F. Palmer and G. Strauss (Labour); Mr Wade (Liberal). Terms of reference are to examine the reports and accounts of nationalised industries and to obtain further information on current policy and practices.

Severe limitations have been placed on the range of matters into which the committee may enquire. Excluded are all matters which concern the responsibility of Ministers, or have been decided by them; concern wages and conditions of employment, where collective bargaining arrangements exist; are provided for by formal machinery set out in the relevant statutes; and are matters of day-to-day administration.

Conference on "The Worker"

A RESIDENTIAL conference to discuss the latest results of research directed to improving the efficiency of the individual worker has been arranged by the Medical Research Council.

It will be held at Cambridge from 31 Mar. to 3 Apr. and will take place at the Union Society with demonstrations in the University Engineering laboratories and in the Council's applied psychology research unit.

Subjects for discussion include environmental effect on working capacity, design of machinery in relation to the operator, the effects of continued or prolonged work on individual efficiency, industrial training problems and the use which is made of research results.

HOTPOINT TAKE OVER PREMIER HEATERS AND COLDRATOR

AS from 1 Apr. Hotpoint Electric Appliance Co., Ltd., is absorbing the business of two other A.E.I. group companies, International Refrigerators Ltd., and Premier Electric Heaters Ltd.

We understand that the whole businesses of these two companies will be absorbed by Hotpoint, that the production, accounting and secretarial functions will come under Hotpoint, but the two companies will remain as the sales organisations for "Coldrator" refrigerators and "Premier" heaters irons and other appliances.

H.P. Restrictions do not suit this trader

MANY traders have welcomed the return of hire purchase restrictions but one trader finds them irksome and has devised a new arrangement to avoid loss of trade.

The firm, the Clydesdale Supply Co., Ltd., who a few months ago established a second shop on Wyle Cop, Shrewsbury, devoted to electrical equipment trading, have introduced a nine months' credit scheme under which the customer is given this period in which to pay the purchase price with delivery against the first payment. 10% is added but rebated when the account is cleared within the period. The customer makes whatever initial payment he chooses. This arrangement reflects the former h.p. arrangements operated by the firm under which customers were allowed as far as possible to fix within reason their own terms to suit their pockets. The firm claimed that this method resulted in a better spirit of goodwill and less inclination to default with payments.

After switching on the new electrical installation at Peckham Park School, last L.C.C. school to be lit by gas, Mr I. J. Hayward, Leader of the London County Council, made a tour of the classrooms. Left to right are Mr R. Mackinnon Wood, O.B.E., M.A., chairman of the education committee, the science teacher, Mr Hayward, Mr H. J. Randall, C.B.E., chairman of the London Electricity Board, and Mr C. Oellinger, the headmaster

U.N. Technical Assistance Debated

BRITISH co-operation with the Technical Assistance department of the United Nations received attention in the House of Commons last week. In the course of a debate, many references were made to the report on the subject issued recently by the Federation of British Industries (ELECTRICAL TIMES, 24 Feb., 1955). M.P.'s took up particularly the need of the department to be able to plan ahead, knowing its financial resources for some years to come; and the difficulties that existed in recruiting necessary experts to plan the work. Replying to the debate, the Joint Under-Secretary of State for Home Affairs, Lord John Hope stated that there was to be a meeting between Government representatives and the F.B.I. today (24 Mar.) to discuss the F.B.I. report. In particular attention would be given to securing more publicity for the activities of the United Nations in the field of technical assistance.

Agreeing that lack of experts was a big factor in slowing work, the Under-Secretary claimed that Britain had produced more men to help in the work than any other country.

Boards should only supply Power, says Traders Secretary

THE PROHIBITION of Area Board sales and contracting activities was advocated by Mr T. N. Hains, West Midlands secretary of the National Chamber of Trade speaking at an E.C.A. branch function in Dudley. Declared Mr Hains: "Electrical current only should be provided by the electricity board, installations and provision of equipment should be left to the private contractor."

Chief guest at the dinner organised by the North Worcestershire and Staffordshire branch of the E.C.A., Mr A. G. B. Owen congratulated the Association on its apprenticeship scheme and said that the best workmen were always those who started from the bottom and that the best apprentices were those who were not content to study in the firm's time but those who also insisted in giving up their evenings to further themselves at night school.

W. T. French/Bescol Tie-Up

ANOTHER co-operative venture reflecting the determination of manufacturers to meet foreign competition is evident in the agreement just concluded between W. T. French and Son Ltd., makers of "Mysto Maid" appliances and Bescol (Electric) Ltd., of "Elephant" Brand domestic appliance fame.

Under this agreement the combined ecorts of the two firms will be used in the production of "Mysto Maid" domestic appliances and the marketing and distribution will be by Bescol (Electric) Ltd.

Bescol has been seeking to expand its own successful business which supplies amongst other things top quality electric elements whereas due to the expansion of their agricultural business the expansion of W. T. French and Company's domestic appliance side has been limited. One of the problems confronting W. T. French and Co. was the supply of elements particularly for their kettles and percolators and in this respect the tie up will be specially advantageous.

Brush to Study Plant Needs of Nuclear Power Stations

ANOTHER large electrical manufacturing company is establishing a special section to study the electrical requirements of the planned nuclear power stations. Brush Electrical Engineering Co., Ltd., have set up a special department at their Loughborough works which will be under the direction of Mr J. H. R. Nixon. In a statement last weekend Brush say they have already developed and supplied specialised electric motors to the Atomic Energy Authority for use in some of the current projects. Further development work is in progress concerning the design of auxiliary equipment for application to large power schemes. It will be recalled that the G.E.C. recently established a similar section at their Erith works.

The First Half-Century

On Monday I had the pleasure of attending the opening of the Electrical Exhibition, held by the County of London Electric Supply Company, at 118-122 Holborn. This was much as in other exhibitions, save that perhaps the motor side was in evidence. There were the usual telephones, radiators, electric pianos, lamps including two varieties of mercury vacuum lamp, lifts, starters, cables, etc. I saw two overload cut-outs one by Messrs Griffith and Biliotti, and one at the stall of Mont-Callow and Co. But the mere index to the exhibition takes up two pages in the catalogue, and it is hopeless to attempt even to indicate what is worth seeing in a note. I can only recommend my readers to visit the exhibition for themselves. The place is nearly opposite the end of Fetter Lane, and in its normal state is known as Gamage's.—*From our issue of 23 Mar, 1905.*

Spacious new demonstration kitchen designed as part of the recently completed administrative office building has been opened for the company's domestic appliance and television division at the English Electric Co's Liverpool Works. A full range of E.E. appliances and television receivers is on permanent display in the kitchen and adjoining lecture room. The kitchen is planned for right to left working and has ample working space provided by Formica topped fitments formed by a series of moveable cabinet units which can be re-arranged at will

Board loses case because it could not prove posting of letter

BECAUSE a letter written in Mar. 1946 could not be traced, an application by the E. Midlands Electricity Board in the Queen's Bench Divisional Court has been dismissed. The Lord Chief Justice, Lord Goddard, described the case as very unusual and very unfortunate. The court heard an application by the Board for an order against the valuation officer in the Aylesbury area to alter valuation lists for Winslow to give effect to a proposal by Northampton Electric Light and Power Co. for alterations in respect of a number of hereditaments. The proposal was made in 1946 but the point at issue was whether it had been properly served. Both sides agreed that if it had been served the rating authority would have to repay £3,270 to the Board. Giving judgment, Lord Goddard said the applicants had produced no evidence that the letter was ever posted. All they had shown was an entry in the postage book. There was abundant evidence that the letter was never received. Had it been posted, the fact that the postman might not have delivered, mattered not.

Apprenticeships for Girls urges Union Chief

WOMEN were in the engineering industry to stay, said Mr Robert Openshaw, president of the Amalgamated Engineering Union addressing the annual conference of A.E.U. women delegates at Torquay.

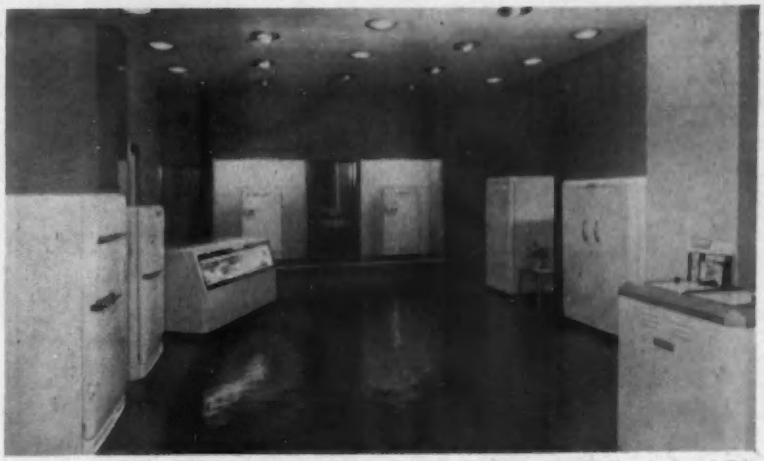
Management should cease to regard women as temporary hands and give them their rightful place alongside the men. Employers in general, he said, do not regard women as capable of equal work and that makes the achievement of equal pay a difficult task. Mr Openshaw emphasised the grave shortage of skilled labourers and said that the Union had urged a policy of apprenticeship for girls. They were awaiting a reply from the employers.

The conference carried unanimously a resolution which reaffirmed its previous condemnation of the existing schedule of women's wages rates and instructed the executive committee to continue to press for the adult male labourer's rate to be paid to women.

The North of Scotland Hydro-Electric Board has taken delivery of a Smiths N.C.B. electric van for operation in the Dundee Area. Based on the 14 cwt chassis the oversized van has been designed to carry refrigerators, cookers and washing machines. It has an increased interior height of 5 ft with a Luton type compartment over the cab to house smaller electric appliances. Its oversize Tudor battery gives a 40 mile daily range

Freedom of Choice for Yorks Council Tenants

ELECTRIC cookers will not be provided in new houses to be built by Aireborough U.D.C. Additional points will only be installed if a specific request is made by the tenant. As reported in these columns last week, this appears to be the trend in council house building being followed in numerous parts of the country. The announcement was incorporated in a council decision to give tenants freedom of choice between gas and electricity. Names and addresses of prospective tenants will be given to the Yorkshire Electricity Board to enable them to canvass householders before occupation.



Newly opened showroom in Crown House, Aldwych, London, H.Q. of the A.E.I. Group is the Coldrator showroom of International Refrigerators. An effect of spaciousness is created by the use of contemporary styled display and planned lighting including spotlights to highlight the equipment displayed

Consultative Council say they've been belittled

THE Association of Municipal Corporation's evidence to the Herbert Committee concerning Electricity Consultative Councils was criticised at last week's meeting of the Yorkshire Council. As previously reported in these columns, the Association maintained that consultative councils were ineffective, being too dependent on the Area Board, having inadequate means of pursuing any objections they might have to the Board's activities, and having insufficient contact with consumers. These views were sent, among others, to the Herbert Committee and also published in the A.M.C. Journal.

At the Consultative Council's meeting Clr. A. Downey objected to the publication of the evidence and said it belittled the Council. He asked that a reply should be made to the allegations. It was pointed out by the chairman, Ald. W. Leach, that in their own evidence the Council had criticised other people in the industry, and it was their own decision to keep their report confidential for the time being. Ald. Leach said it appeared in general that bodies inside the industry had not publicised their reports while those outside had.

Witton Apprentices Dinner

AT NO TIME in our history were the opportunities for young engineers better, according to Prof M. G. Say, in his response to the toast "The Guests," at the annual dinner of G.E.C. Witton Apprentices' Association. He endorsed the comments of Mr O. W. Humphreys, director of the company's research laboratories at Wembley who said that G.E.C. considered its training schemes as an important investment. The apprentices too were investing their time obtaining training and this would pay good dividends in the future. After the presentation of awards to the apprentices by Mr J. J. Gracie, a director of the G.E.C. and general manager of the Witton engineering works, the evening closed with an amusing show, "Revolt," portraying life at Witton in 1985. This was written and produced by Peter Barton, an old Witton apprentice and music composed by Malcolm Stuart, a graduate apprentice.

ETCTA form New Branch

AT a meeting early last week the new Manchester branch of the Electrical Trades' Commercial Travellers' Association was established and officers appointed to set it off along the right lines. Entrusted with the latter task were Mr R. H. Corlett, chairman, Mr W. Smith of The Dale, Westbourne Park, Urmston, secretary, Mr Littlewood, treasurer, and Mr J. B. Jones, vice-chairman. There was good reason for encouragement in the large membership of 107 which resulted from this and the previous meeting last month when Mr A. T. Haywood, the Association's president addressed local sales representatives and suggested the formation of a branch. The next meeting will be held on 18 Apr. at the "Swan with Two Necks" in Withy Grove, Manchester, beginning at 7 p.m.

Further Trade Visit to China

SECOND party of British businessmen is due to arrive in Peking on 30 Mar. They are going under arrangements made last November at the invitation of the China National Import and Export Corporation. The Sino-British Trade Committee say that the party will consist of representatives of about fourteen companies, some of whom will be joining the group in Hong-Kong. They will remain in the Chinese capital for two or three weeks, and in addition to business discussions the party hopes to arrange for further visits in the future.

Representatives of Bailey Meters Controls Ltd. and I.C.I. Ltd. are included in the party, led by Mr S. A. Lane, of Brush.

SPENCER WIRE MERGER

THE whole business of the Midland Expanded Metal Co., Ltd., of Tipton, Staffs, has been acquired by the Spencer Wire Co., Ltd., Wakefield, Yorks. The plant and business has been transferred to the head office and works, Thornes Wire Mills at Wakefield, where the manufacture of expanded metal and Perfection "C" lathing is in course of production. Mr John B. Lidell, a director of the company is in charge of sales, the chief sales office being located at 53 Victoria St, S.W.1. Area sales offices are established at Birmingham, Wakefield and Glasgow, with others to follow at various industrial centres.

Women in the News

WEST RENFREWSHIRE is the latest Scottish branch of the Electrical Association for Women with Mesdames Mackay, Mitchell and Davies as chairman, secretary and treasurer respectively. New Yorkshire branch has been formed for Malton, Norton and District with Mrs E. Wilson, Miss K. Cobb and Mrs O. Garbutt as officers.

In comparison with these new arrivals the Watford branch has just celebrated its twenty-first birthday.

NEWS IN BRIEF

Demonstration of the Osram 912 high-quality gramophone amplifier, operating in conjunction with the G.E.C. metal cone loudspeaker is being arranged for Luton radio dealers by John E. Dallas and Sons Ltd. It will take place on 31 Mar. at Warden Tavern at 7.30 p.m.

80 Members of the ex-J. and P. Association met at the Grosvenor House, Park Lane, W.1, recently for a happy re-union dinner. An invitation is extended to all men who worked for or were associated with Johnson and Phillips to get in touch with the Honorary Secretary, Mr W. F. Smith, 66 Coleraine Rd, S.E.5 (Greenwich 1493), for details of the Association.

"Evershed News," House organ of Evershed and Vignoles Ltd., has a new editorial policy. It will be issued bi-monthly.

Public address control equipment, to replace that destroyed by fire, has recently been installed at Romford Greyhound Racing Stadium, Essex, by Philips Electrical Ltd.

New equipment designed to test television picture tubes to laboratory standards has been brought into operation at Mullard Valve Service Depot, Glasgow.

A Selection of latest Mazda commercial and industrial lighting fittings comprise a special display at the Building Centre, Store St, London, at present.

Salford Corporation is to provide a £57,000 all-electric public washhouse, including drying and ironing facilities.

The illustration from British West Africa published on page 371 of our 3 Mar. issue was by courtesy of "Daily Service" (proprietors, the Amalgamated Press of Nigeria Ltd.).

QUESTIONS IN PARLIAMENT

Nuclear Development Costs

THE estimate that £300m capital expenditure would be involved in the 10-year programme for nuclear power development does not allow for any interest charge, Mr Geoffrey Lloyd, Minister of Fuel and Power, told a questioner last week. He did not suggest what interest rate was applicable, but denied that the sum mentioned would be nearly doubled by the time all interest charges had been paid.

Commissioning Programme

ANSWERING Mr Gerald Nabarro, Mr Lloyd reviewed the commissioning programmes approved for England, Wales and South Scotland up to 1959 (1,950 MW for the last year), and said that the 1960 programme had not yet been decided. Commissioning authorisations for the North of Scotland Hydro-Electric Board for the years 1955-59 inclusive are 146, 81, 52, 51 and 86 MW respectively.

Research Associations

THE Parliamentary Secretary to the Ministry of Works, Mr Bevins, said last week that no capital grants are expected to be made to research associations during the present financial year because no requests for payment of such grants are considered likely within that period.

British Standards

THE President of the Board of Trade is confident that no action is required to ensure that the British Standards Institution shall have full regard to the interests of industry and of the public. This was said in a written answer to a question last week and the comment was also made that only one-third of the Institution's funds came from public sources.

Radio Interference

ASKED by Mr Errol what steps were being taken to ensure that television screens were adequately suppressed or screened to prevent their causing interference to sound radio reception, the Assistant Postmaster-General stated in a written reply that owners of television sets were liable to have their licence withdrawn if their apparatus caused interference with sound radio receivers. The problem of designing television sets so as to avoid such interference was largely a matter for the radio industry to solve. They were fully alive to it, and the Post Office was co-operating with them.

Back Pressure Turbines

FURTHER analysis of the industrial steam survey published during 1953 had suggested useful possibilities of saving coal by installing back pressure engines, said Mr Geoffrey Lloyd in reply to a question put by Mr Nabarro last week. The Fuel Efficiency Advisory Committee was considering how these possibilities could best be realised, and the National Industrial Fuel Efficiency Service was being supplied with details of the establishments where prospects of coal saving were best. Mr Lloyd promised to have special regard to the need for persuading the British Electricity Authority to view favourably proposals made by private owners of back pressure turbines for parallel working.

T.V. Coverage

COVERAGE of commercial television transmissions was primarily a matter for the Independent Television Authority to decide, said Mr Gammans, Assistant P.M.G., in a written reply last week. He further stated that the effective radiated power from the aerial at the Croydon transmitter would be 60 kW.

Imported Goods

IN an answer last Thursday, Mr Peter Thorneycroft, President of the Board of Trade, said that he would be making a decision soon about withdrawal of the option under the Merchandise Marks Act, 1926, which allows imported goods to be marked "Foreign" or "Empire" instead of with the name of the country of origin.

Radio-Activity in Works

DISCUSSIONS on whether it was necessary to make special regulations to safeguard workers using radio-active substances were well advanced, said Mr Harold Watkinson, Parliamentary Secretary to the Ministry of Labour, in a reply last week.

Factory Inspectorate

AT PRESENT 294 Factory Inspectors are in posts out of a total of 309, said Mr Watkinson replying to Dr Stross last week. These figures exclude senior and specialists posts. An intensive study of the difficulty of recruiting sufficient technical trained men and women to the factory inspectorate was under way within the department.

Underground Gasification

DETAILS were given last week on the trials at Bayton and at Newman Spinney of underground gasification. In his statement, Mr Geoffrey Lloyd, Minister of Fuel and Power, said that about 3,000 tons of coal had been gasified since 1949. Total expenditure to the end of current financial year would amount to some £660,000, and more than one-third of it would have been spent at Bayton where slightly less than one-half the coal was gasified. It was planned to begin demonstrations of the continuous production of usable gas later

this year at both sites, using different techniques. These tests would last several months, and a full report on the work would be published at about the same time. The possibility of work on a full production scale depended on result of these tests.

N.P.L. Computor Staff

DUTIES of the eight scientific staff employed at the National Physical Laboratory on the application of electronic computors to clerical and industrial work were enumerated by Mr Bevins. He said they carried out research on the use of electronic computors in clerical fields, especially large-scale accountancy and the processing of information. In addition they were investigating the use of the machines for solving mathematical problems in industrial work, particularly in the aircraft industry, and the control of machine tools by methods involving the computors.

University Grants

A STATEMENT on grants to university students can be expected soon, Sir David Eccles indicated in the Commons last week. He explained that the number of bodies who had made representations was extraordinary and he had felt bound to consider all of them. Sir David added that the scheme, whatever it might be, would start in September.

Hire Purchase Statistics

COMPLETE absence of statistics on hire-purchase transactions has been the subject of annoyance in many quarters recently. Mr P. Thorneycroft said in the House last week that he was examining the practical problems of collecting such figures without placing too great a burden on retailers. He had consulted with retail organisations and was also examining the possibilities of a sample investigation.

Sayings OF THE WEEK

"Management must cease to regard women as temporary hands and must reorganise not only their own thinking but their factories to give women their rightful place alongside men in industrial life . . ." MR R. OPENSHAW, president, Amalgamated Engineering Union, at Torquay.

"I can see no hope of general factory lighting ever serving industry as it should until a true balance is struck between natural and artificial lighting, and until we cease to treat artificial lighting as merely a necessary evil . . ." MR W. ROBINSON, E.D.A. Lighting Officer speaking at the Slough branch, Institute of Industrial Administration.

"Because coal has had to be restricted for so long, gas and electricity have been given an unfair edge which might not have occurred to the same extent or as fast if there had been the amount of coal the public could buy quite freely . . ." MR GEOFFREY LLOYD, at Birmingham.

ELECTRIC SUPPLY NEWS

Bangor (N. Wales)

Because the Bangor Provident Trust, a private concern which plans to build 300 houses at Bloomfield Road, has been asked for a yearly guarantee of £6 for five years for the supply of current to each house, by the Electricity Board for Northern Ireland, members of the borough council have voiced protests. Some members considered it would ostracise the use of gas cookers (the local gas undertaking is owned by the council), but others thought that 30s. p.q. was not unreasonable.

Blyth

Concerning our note last week of the Minister's consent to the B.E.A.'s proposal to erect a power station at Blyth, it should be made clear that the method of disposal of the station's ash remains the subject of a Bill which it is hoped will come before Parliament during the present session. As we have already noted, that Bill proposes the acquisition of land and easements, for the purpose of constructing works necessary for the discharge of ash and water from the station. The work would include a line of pipes and an aqueduct to sluice the ash into the sea.

Douglas (I.o.M.)

As a further measure to encourage increased electricity consumption, Douglas Town Council has now decided that as from 1 July next, all domestic and seasonal private hotels and boarding-house consumers are to be placed on an all-in tariff. Under the latter there will be a fixed quarterly charge of 10d. in the £ of rateable value of consumers' premises, plus a running charge of 1¼d. for the first 250 units p.q. and 1d. per unit in excess. The present alternative flat rate light and power tariff is being discontinued. During discussion at the Council meeting, one member said he did not consider it right that any consumer should be forced on to the new rate if he did not wish to do so. Another thought some of the small consumers would be hard hit, but it was explained that it would prove a boon to most consumers, particularly the boarding houses.

The Electricity Department anticipates an expenditure of £32,000 on transformers, cables, meters and cookers in the next financial year. It was also reported that the corporation's electricity undertaking is making a recovery. Losses totalling £51,192 over the three previous years have been followed by a profit of £647 in the year now ending; and a surplus of £5,000 is expected in the coming year. The reasons for this are given as: increased consumption, improved efficiency of new generating plant, and the new arrangement with the Isle of Man Electricity Board for interchange of supplies from last November.

Eire

In moving the estimates in the Dail recently, Mr Sweetman, Minister for Finance, pointed out that the Electricity Supply Board had shown a profit of nearly £250,000 last year, and was doing well again in the current year. The Board had reached a position in which it could assume responsibility for rural electrification, and thus relieve the taxpayer of the subsidy that was originally provided when rural electrification had hardly advanced beyond the planning stage.

Ilfracombe

Opposition to a proposal of the South Western Electricity Board to erect overhead lines to supply part of the Slade Valley neighbourhood with electricity, was expressed at last week's meeting of the Urban Council. Mr T. Brown declared that as a planning authority, the Council should say that the time was approaching when it must put its foot down. If visitors ever arrived at Ilfracombe by helicopter they would think that they were coming into a bird cage, he added. Mr J. L. Jemmett pointed out the source from which the electricity was going to be tapped was in the middle of a Council estate which was garlanded with wires. "If they wanted to oppose the thing, they should have opposed it from the start," he said. Mr F. G. Reed explained that the Council of that time did oppose it but unsuccessfully.

Glamorgan

The County River Board has decided to withdraw their objection to the erection of a power station at The Leys, near St Athan, proposed by the B.E.A., provided their interests in land drainage, fisheries and pollution are safeguarded. At a joint committee meeting earlier in the day Mr A. H. Williams, the Board's Chief Pollution Prevention and Fisheries Officer, said there was enough available land at The Leys for ash tipping from the power station for 25 years, but before this stage was reached the B.E.A. hoped to turn over to atomic power.

LIGHTING SCHEMES

Bentley. U.D.C. is to replace gas street lighting with electricity.

Surbiton. It is proposed to improve lighting along Kingston By-pass Rd. at a capital cost of £22,000.

Uxbridge. The council has obtained Ministry consent to borrow £6,928 for improved street lighting in Cowley Mill Rd, Waterloo Rd, Iver Lane, Cowley, Ryefield Ave, Hillingdon, Sutton Court Rd, Windsor Ave, and Royal Lane, Hillingdon.

Woking. Proposed improved street lighting in the main thoroughfares and on the road through Byfleet and West Byfleet, is estimated to cost £20,000.

COMPANY ACTIVITIES

ALTHOUGH our industry did extremely well last year, a note of warning was sounded by Sir George Nelson at the annual meeting of the English Electric Co. "Our greatest forward problem," he said, "is that associated with continued raising of basic wages in so many industries and services, which are not associated with any obligation to increase output or improve efficiency." The English Electric policy is to give stable employment to all employees, with extensive facilities for high earnings for high effort through their schemes of payment by results. Sir George said that "such facilities are available to the bulk of our employees on the shop floor." He warns shareholders what might happen following the latest general increase in wages in the industry which is not tied to any obligation for any further extra output.

"The profit on our turnover last year," he said, "had actually fallen from 6·15% to 5·85%, and our workers, paid by results, received extra rewards for their additional output."

But the national award, according to Sir George, will ultimately increase the cost on present turnover, by about 3½%, which, at existing prices means that present profit at 5·85% would fall to 2·25%.

Star turn this week is Switchgear and Cowans with a sharp recovery in profits and a doubled dividend. Net profits before tax recovered from £54,000 to nearly £92,000. After depreciation, etc., the net profit is doubled at £24,000. Tax was £60,750 compared with £35,350. During the previous year, the company undertook a very heavy re-tooling programme, which absorbed most of the profit arising from increased production. The past year has obviously benefited from the programme.

Shareholders of the London Electric Wire and Smiths are to be given an opportunity to subscribe for 400,000 £1 Ordinary shares at 47s. 6d. each in the proportion of one new for every £5 Ordinary stock now held. At the time of the issue, the market price for the existing Ordinary shares was 51s., so that the new issue represents a nice little bonus.

Dealings started on Thursday in the £500,000 capital of Relay Exchanges. The capital is all in one class of 5s. shares. Parallel with the introduction, there was a placing of 6% Unsecured Convertible Loan Stock 1962/65. This stock issue was made towards meeting the costs of the group's expansion programme. Relay Exchanges owns the entire share capital of radio, relay and rental companies. Practically the whole of its resources during the past two years have been devoted to the renting of television sets. The directors consider there is not at present sufficient technical or commercial savings to justify the widespread development of the wire system. Opinion may be changed when multiple television programmes are available.

Profits have increased very rapidly in the last three years from £29,000 before tax for the calendar year 1951, to £176,000 in 1954. There is a prospective dividend of 10% which will be covered, after profits tax, by equity earnings of 26½%. Dealings began in the Ordinary last Thursday around 10s. 6d. which means a dividend yield of about 5%. This is not particularly exciting but the cover is adequate and there are prospects of growth.—*From our City Correspondent.*

British Vacuum Cleaner & Engrg. Co.

With a group profit, after all taxation, for the year ended 30 Sept. last, amounting to £99,265, compared with a loss of £32,331 in the previous year, the directors recommend a dividend of 30%, against 25% last time.

Bylock Electric Ltd.

Group profit for the year ended 31 July last is £44,178 (*£13,506*). The dividend is raised to 33⅓% (*20%*).

A. F. Bulgin and Co., Ltd.

The net profit, after taxation, is £47,828 (*£31,618*). The dividend is increased to 45%, compared with 30% for the previous year.

English Electric Co.

The company's offers to acquire the Ordinary stock of Vulcan Foundry and Robert Stephenson and Hawthorns Ltd. have been accepted by holders of more than 90% of the stocks. Sir George H. Nelson, chairman and managing director, also referred to the improvement in the volume of export orders in 1954, compared with 1953, but he warned that competition in some countries had been intense. He hoped that both those controlling world manufacturing facilities, and governments who were providing direct or indirect export subsidies, would return to sane world trading conditions as quickly as possible, as the present conditions they were supporting were, in the long view, unhealthy for all parties.

London Electric Wire Co. and Smiths Ltd.

In a scheme for expansion of productive capacity in order to meet the constantly increasing demand for the company's products, the directors have obtained the consent of the Capital Issues Committee to the issue of 400,000 Ordinary £1 shares. It is proposed to offer these to the Ordinary stockholders at 47s. 6d. each in the proportion of one new share for every £5 of Ordinary stock held. Although the accounts for 1954 are not yet finalised, the directors estimate that profits will be higher than for 1953 and are prepared to recommend payment of a final dividend of 8½% on the existing Ordinary shares, making the total dividend for the year 12½%, against the equivalent of 10% for 1953.

Marconi's Wireless Telegraph Works Co., Ltd.

The new works at Basildon, completed last June, have already handled a considerable volume of aeronautical and v.h.f. communications equipment, Sir George Nelson, the chairman, stated at the annual general meeting last Thursday. Valuable orders have been obtained for radio communication and television equipment for various countries, and the company has developed a fully electronic compatible colour television system—enabling the present TV sets to receive colour transmissions in black and white without appreciable loss of definition, Sir George added.

Rheostatic Co., Ltd.

There is a healthy increase in profits for the year ended 30 Sept. The Group trading profit is £302,596 compared with £227,456 for the previous period. The parent company's net profit is returned at £67,065 (*£51,152*), to which is added £8,400 (*nil*) profit on the sales of an investment. The dividend is raised by 2½% to 22½% (with a final of 15%), plus a special bonus distribution of 2½% out of non-taxable capital profit. Treasury consent has been received for the proposed three-for-five scrip issue.

Shawinigan Water and Power Co.

Revenue from sales of electricity during 1954 totalled $42,042,323, an increase of 8·4%. After all charges, the net profit amounts to $7,270,260 (*$5,952,564*). The year was a record as regards gross revenue and peak load, Mr J. A. Fuller, the president, states. Almost 10,000 new consumers were connected during the year, and the average annual consumption continues to increase.

Switchgear and Cowans Ltd.

The net profit, before taxation, for the year ended 31 Dec. last, jumped to £91,798, compared with £54,054 for the previous year. The dividend is raised from 10% to 20%.

Thorn and Hoddle Ltd.

For the year ended 30 Sept. last, the gross trading profit is £21,971 against £24,137 a year ago. After taxation, etc., the net profit is £1,826 (*£3,117*) and the Ordinary dividend is again 15%.

Wolf Electric Tools (Holdings)

A 2½% increase on dividend is also to be paid by this concern. The group net profit for 1954 amounts to £167,391, compared with £91,479 for the preceding year, and the dividend is raised from 17½% to 20%.

Dividend Declared

Nigerian Electric Supply Corporation Ltd. Interim 4% (*same*).

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

25 Mar.—Manchester T.C. Various types of service cables and telephone cable at Haweswater Works, Westmorland.—Advertised in 24 Feb. issue.

25 Mar.—Roxburghshire. Electrical work in houses at Denholm.—See 10 Mar. issue.

28 Mar.—Stockton-on-Tees T.C. Electrical work in 25 houses and three blocks of three-storey flats at Newtown Estate. —See 17 Mar. issue.

30 Mar.—Bradford T.C. Electrical installation in 282 dwellings on Halifax Rd estate. City Engineer and Surveyor, Town Hall. Deposit £2. 2s.

30 Mar.—Warrington T.C. Rewiring at Central Police Station in Arpley St. Borough Surveyor, Town Hall.—See 10 Mar. issue.

30 Mar.—Yeovil T.C. Steel columns with lanterns, lamps, etc., for mercury vapour and tungsten street lighting scheme 1955-56.—Advertised in 10 Mar. issue.

31 Mar.—Belfast T.C. Central evaporating plant.—Advertised in 27 Jan. issue.

31 Mar.—Carlisle T.C. Installation in crematorium.—See 10 Mar. issue.

31 Mar.—Durham C.C. Supply of heavy duty cooking equipment to central kitchens, school canteens, etc., during year.—See 17 Mar. issue.

31 Mar.—Inverness. Electrical work in erection of primary school at Hilton. —See 3 Mar. issue.

31 Mar.—Manchester T.C. Electrical installations in 68 maisonnettes and flats —contract 222, Ridgway St, Ancoats. Director of Housing, Town Hall, Manchester 2.—Advertised in this issue.

31 Mar.—Pontardulais. Re-wiring of "Hope" Congregational Chapel, Pontardulais. A. T. Griffiths, secretary, "Maes-Glas," Ffosyrefail Ter, Pontardulais. Deposit £2.

31 Mar.—Saltburn and Marske-by-the-Sea U.D.C. Supply and erection of 12 street lighting units.—See 17 Mar. issue.

31 Mar.—Waltham Holy Cross U.D.C. Supply erection wiring of 50 concrete columns for class A sodium lighting along A.112 and B.194. Names by above date to H. J. Chapman, clerk, Town Hall, Waltham Abbey.—Advertised in this issue.

1 Apr.—Dublin T.C. Supply of one thousand 100/200 W fittings for Public Lighting Dept. City Manager and Town Clerk, Finance Department, City Hall, Dublin.

1 Apr.—N. Ireland. Electrical installation, including l.t. underground cable and MIMS conductor from existing main intake switchroom at Mid-Ulster Hospital, Magherafelt. W. and M. Given, consulting engineers, Waterside, Coleraine. Deposit £3.

2 Apr.—Belfast. Electrical installation in Royal Belfast Hospital for sick children. Consulting engineer, J. M'Candless, 6 Murray St, Belfast. Deposit £3. 3s.

2 Apr.—Cheadle and Gatley U.D.C. Group A concrete columns with sodium lamps and lanterns in Wilmslow Rd.—See 3 Mar. issue.

2 Apr.—Dublin. Electric wiring installation in Nurses' Home extension at Mercer's Hospital.—See 17 Mar. issue.

2 Apr.—Ipswich T.C. Supply and erection of 21 group A lanterns, control gear, etc., and 11 steel columns for fluorescent lighting in town centre.—See 17 Mar. issue.

2 Apr.—Kilmarnock T.C. Supplies of electric lamps for all departments for year commencing 16 May, 1955. Burgh surveyor's office, 11 London Rd, Kilmarnock.

2 Apr.—Nuneaton T.C. Erection and putting into service 42 street lamps to Class "B" standard. Borough Surveyor, Council Hse, Nuneaton. Deposit £2. 2s.

4 Apr.—Osgoldcross R.D.C. Electrical installations in 12 council houses at Balne. Engineer and surveyor, Tanshelf Hse, 15 Frost St, Pontefract.

6 Apr.—Wandsworth B.C. Concrete columns and ancillary gear for groups A and B street lighting.—Advertised in 10 Feb. issue.

6 Apr.—Wandsworth B.C. Sodium discharge lamps and jackets for route J.—Advertised in 24 Feb. issue.

7 Apr.—Belfast T.C. 3,300 V and 400 V switchgear and accessories. Also (closing date **24 Mar.**) extensions of coal handling plant.—Advertised in 10 Feb. issue.

7 Apr.—Belfast T.C. Electrical installation in Orangefield secondary intermediate school for boys.—See 17 Mar. issue.

7 Apr.—Edinburgh. Lighting, power and bell installations at new fire station, etc., at Bathgate. Dick, Peddie and McKay, architects, 8 Albyn Place.

7 Apr.—Glasgow T.C. Supplies of electrical accessories to the Lighting Department.—See 17 Mar. issue.

7 Apr.—Leek (Staffs) U.D.C. Erection and installation of 20 Class A street lighting columns and lanterns in Broad St, and Brook St, A.53. J. A. Gilchrist, engineer and surveyor, Town Hall, Leek. Deposit £2. 2s.

8 Apr.—Dunfermline T.C. Electrical installation in 36 houses on "Gap" sites. Surveyors, C. R. Douglas and Co., 15 East Port.

12 Apr.—Dewsbury T.C. Rewiring at Cliffe Hse school, Shepley. Borough Architect and Buildings Surveyor, Town Hall.

12 Apr.—Newcastle-under-Lyme T.C. (*a*) Supply and installation of lanterns, lamps, control gear and concrete columns, for 140 W horizontal sodium vapour discharge lamps, for 1½ miles of route A.519; (*b*) supply and installation of lanterns, lamps, time switches and concrete standards for 250 W horizontal MV discharge lamps for 570 yds of route B.5367. Borough Engineer, Lancaster Buildings, High St, Newcastle, Staffs. Deposit £2.—Advertised in this issue.

13 Apr.—Penzance T.C. Supply of electric lamps in year from 1 Apr. Borough Engineer and Surveyor, Municipal Bldgs.

14 Apr.—Plymouth T.C. Six electrically-driven pumps for Water Dept.—See 10 Mar. issue.

18 Apr.—Nottingham T.C. (*a*) Provision of steel tubular light columns, and (*b*) of 140 W cut-off sodium lighting equipment for section of trunk road A.614.—Advertised in 17 Mar. issue.

21 Apr.—Belfast T.C. One bulldozer for moving coal at power station West coal store.—Advertised in 17 Mar. issue.

2 May—Kingston-on-Hull T.C. Supply, erection, etc., of diesel engines, alternators, electrically driven centrifugal borehole and booster pumps, electric motors, switchgear, etc., at Springhead pumping station.—See 17 Mar. issue.

18 May—Dublin T.C. Electrically-driven sewage pumps for Clontarf station.—See 24 Feb. issue.

No date stated.—Lanark T.C. Electrical work in one block of sixteen houses at Braxfield site, New Lanark. Apply to R. T. Stewart, Town Clerk, Town Clerk's Office, Lanark, by 28 Mar.

No date stated.—Lancs C.C. Electrical installation at Freckleton, County Surveyor's Depot. Apply to County Architect, P.O. Box No. 26, Preston by 29 Mar. quoting ref. A/MG.

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources including an index of trade information with over 100,000 entries

A Selection from the 98 queries answered this week

"Grey" vacuum cleaners, suppliers of? E.B.—S. Grey and Co. (1939) Ltd., Edgware Rd, The Hyde, N.W.9.

"Sololite" bed light, makers of? A. and NS.—Ollvex Co., Ltd., 102 Albany St, N.W.1.

"Minifon" miniature recorder, suppliers of? W.S.—E.M.I. Sales and Service Ltd., 363/367 Oxford St, W.1.

"Schick" shaver, agents for? H.M.—Sydney H. Mugford, 11 Hills Place, W.1.

"Timiec" clocks, repairers of? E.P.—Comer Electrical Repair Service, 23 Bridge St, Taunton, Som.

"Apex" fusegear, makers of? Foster Transformers Ltd., South Wimbledon, S.W.19.

Safety 1 for 1 transformers for shavers, makers of? B.E.E.—To order: Kentish Electrical Eng. Co., 3a Mornington St, N.W.1; Valradio Ltd., New Chapel Rd, High St, Feltham, Middx.

German made cable, suppliers of? A.S.—Neoflex Ltd., Lye Green Road, Chesham, Bucks.

No date stated.—Lancs C.C. Electrical installation at Huyton St Dominic's R.C. school. Apply to county architect, P.O. Box No. 26, Preston, by 29 Mar., quoting Ref. A/LP.

No date stated.—Norwich T.C. Automatic internal telephone system with approx. 200 extensions. Apply to H. C. Rowley, City Engineer, City Hall, Norwich, by 2 Apr.

No date stated.—Peterhead. Electrical work in new hall, bar and cloakroom, etc., at the Palace Hotel. Apply to A. M'Crombie, architect, 85 High St, Inverurie.

No date stated—West Fife. Electrical work at Northern Hospital, Dunfermline. —See 10 Mar. issue.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon House, Theobalds Rd, W.C.1, quoting reference.*

5 Apr.—Canada. Four dust-collecting units with storage hoppers, etc., for Brandon power station, Manitoba Hydro-Electric Board. B.o.T. (Ref.: ESB 5851/55).*

12 Apr.—Thailand. Diesel engine generator sets, 120/240 V, for the Foreign Operations Administration, Procurement Branch, Room 2707, Temporary 5th Building, 16th St, and Constitution Ave, Washington, D.C.

14 Apr.—Egypt. Overhead transmission line for connection of Cairo South and Tabbin power stations to Cairo Ring Main and extension to Basatin switching station. Documents from Egyptian Embassy, 24 South St, London, W.1, at £E7.

16 Apr.—Iraq. Directorate General of Municipalities, Baghdad, invites tenders for supply and erection of 200 kW generating set with switchboard, etc., for Musayab. Tender No. 95. B.o.T. (Ref.: ESB 4428/55).*

18 Apr.—India. Three 1,000 kW diesel generator sets, 11 kV, 3-phase, 50 cycles, and three sets of 11 kV switchgear, 150 MVA, for Central Stores Purchase Organisation, Old Custom House Yard, Fort, Bombay. B.o.T. (Ref.: ESB 5134/55).*

20 Apr.—S. Rhodesia. Overhead line material for City of Bulawayo; 5,000 line taps, max size 0·025 sq in., 500 30 A house service cut-outs, 50 cable dividing boxes, 1,000 250 W blended light lamps, 50 pole mounting drop-out switch fuses for 22 kV, and 144 surge diverters for 11 kV. B.o.T. (Ref.: ESB 5610/55).*

27 Apr.—Australia. One 160 kW, 430 V, a.c. alternator with exciter, for Hughenden T.C. Tenders to secretary, State Electricity Commission, Scottish Union Hse, Eagle St, Brisbane. B.o.T. (Ref.: ESB 4928/55).*

5 May.—Iraq. Supply and installation of electrical services and/or air conditioning for new Baghdad Museum of Antiquities. Contracts SS1/1955 and SS2/1955. Documents available at Iraqi Embassy, 22 Queen's Gate, London, S.W.7.

10 May.—New Zealand. Six contactors, triple pole, 400 V, 30 A, a.c., and six ditto 400 V, 60 A., for Director General, Stores Division, G.P.O., Wellington. B.o.T. (Ref.: ESB 5377/55).*

26 May.—India. Oil engine driven alternator sets, 420/243 V, 3-phase, 50 cycles, for Directorate-General of Supplies and Disposals, Shahjahan Rd, New Delhi; four 50 kW, two 60 kW, two 100 kW, one 150 kW, one 250 kW and one 300 kW. Also three 50 kW and two 100 kW alternators, one 60 b.h.p. diesel engine, 14 electric pumping sets, seven air compressors, and various alternator control and feeder panels, and cable. B.o.T. (Ref.: ESB 5502/55).*

30 May—Portuguese E. Africa. Supply of 66 items of electrical equipment including 240 iron insulator supports 48 insulators, 708 porcelain supports for resistances, etc.; tender No. 20/55. Also supply of 53 other items including vacuum cleaner, fluorescent tube, switches, etc.; tender No. 30/55. Port, Railways and Transport Dept., Laurenco Marques. B.o.T. (Refs.: ESB 4848/55 and 4849/55).*

31 May—Iraq. One 600 kW diesel driven alternator with control gear, etc., and one 1,000 kVA transformer, at Sulaimaniya, for Directorate-General of Municipalities, Baghdad.

6 June—Australia. Snowy Mountains Hydro-Electric Authority require various electric controls for jet flow and ring follower gates at Tumut Pond Dam. Chief Administrative Officer of Authority, Box 4900, G.P.O., Sydney. Contract No. 50,021. B.o.T. (Ref.: ESB 4740/55).*

9 June.—Kuwait. Delivery and installation of 20,000 yds, 3-core, 0·4 sq in. oil-filled p.i. cable and pilot cable for 33 kV system. One copy of tender form from President, Dept. of Electricity, Government of Kuwait, Arabia, Ref. 5305/EI. Others from consulting engineers, Ewbank and Partners, 10/11 Grosvenor Place, S.W.—Advertised in this issue.

21 June—New Zealand. Tenders invited for 184 220 kV single circuit galvanised steel transmission line towers, comprising tower bodies, body extensions, leg extensions, earthwire extensions, etc. Contract 267. State Hydro-Electric Dept., Wellington. B.o.T. (Ref.: ESB 4308/55).*

28 June.—New Zealand. One 50 MVA, 11/220 kV transformer bank and spare unit for Wairakei power station, for State Hydro-Electric Dept. B.o.T. (Ref.: ESB 5520/55).*

26 Aug.—India. Equipment for Gandhi Sagar power station of Chambal project, Madhya Bharat, comprising mainly: three sets hydro-electric generating plant with 34,000 h.p. turbines, 23,000 kVA generators, etc.; 11/132 kV step-up transformers; 132 kV switchgear, 400 V a.c. switchboards, etc.; cables. Director General of Supplies and Disposals, New Delhi. B.o.T. (Ref. ESB 5032/55).*

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, 22 March

	£ per ton	Weekly change £	Price last year £
COPPER, standard class A (settlement)	368	+25	236
„ (3 months)	358½	+26	227½
LEAD, refined pig, min. 99·97% purity (cash)	105½	+1½	88½
„ (3 months)	104½	+1½	87½
TIN, refined, min. 99·75% purity (settlement)	714	+5	747½
„ (3 months)	716	+4	700
ALUMINIUM, ingots 99-99·5%	163	—	156
ZINC, virgin, min. 98% purity (cash)	89½	+½	75½
„ (3 months)	87½	+½	74½
RUBBER No. 1, RSS, spot (per lb.)	26¼d.	−⅛d.	16¼d.
„ c.i.f. basis, ports, June (per lb.)	25½d.	−⅛d.	16⅛d.
ARMOURING:			
Galv. Steel Wire (0·104 in.)	52½	—	52
Mild Steel Tape (0·014 in.)	41½	—	40½

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, W.C.2.

Brader and Stocks Ltd. 10 Town Hall St, Grimsby. Mechanical, electrical and general engineers, etc. Nom. cap.: £4,000. Dirs.: A. Brader and R. L. Stocks.

Edy (Gt. Britain) Ltd. Farnley Low Mills, Wortley, Leeds, 12. Manufacturers of and dealers in washing machines, spin drying machines, floor polishers, etc. Nom. cap.: £1,000. Dirs.: F. Horn and S. Croudson.

Bentley and Clough (Pudsey) Ltd. Tannery Yard, Lowtown, Pudsey, Leeds. Electrical engineers and general electrical installations contractors, etc. Nom. cap.: £1,500. Permt. dirs.: B. Clough and Mrs C. Clough.

Transtherm Ltd. 149 Scraptoft Lane, Leicester. Manufacturers of and dealers in electrical goods, including condenser cores, dynamos, armatures, etc. Nom. cap.: £1,000. Dirs.: To be appointed by subs. Subs.: S. S. Mills and R. N. Kidger.

Suez Contractors (Electricity) Ltd. To operate under contract with H.M. Principal Secretary of State for War Department or any other Minister or Department of H.M. Government public utility installations, services and works of all kinds in the Suez Canal Zone, etc. Nom. cap.: £100. Dirs.: Not named. Subs.: R. A. Clarke and K. E. Wright, 18 Austin Friars, E.C.2.

"Only" Components Ltd. General, mechanical, electrical, oil-fuel, constructional, marine, civil and consulting engineers, machinists, etc. Nom. cap.: £2,000. Dirs.: Not named. Subs.: A. R. F. Onions and Mrs G. Onions, 8 The Close, Bryn Newydd, Prestatyn.

H. G. Barnett and Partners Ltd. Electrical engineers and contractors, etc. Nom. cap.: £5,000. Dirs.: H. G. Barnett and Mrs M. H. Barnett, 96 Burlington Rd, Blackpool.

CONTRACTS PLACED

Briggs (Lincs) U.D.C. Street lighting scheme along trunk road. British Thomson-Houston Co., Ltd., £4,010.

Caerphilly U.D.C. Supply of 114 group A units with 140 W sodium lamps, lanterns, etc., along A.469 to Llandradach, British Thomson-Houston Co., Ltd., £9,656.

Hartlepool T.C. Street lighting scheme between Milbank Cresc and Broughton St, Revo Electric Co., Ltd., £2,102.

BUSINESS PROSPECTS

Atcham R.D.C. Erection of 34 houses. Surveyor, 24 St. John's Hill, Shrewsbury.
Banstead U.D.C. Erection of 54 flats and 35 garages on Nork Way/Eastgate site and 86 dwellings on Shawley Way site.
Belfast T.C. Erection of 93 dwellings at Clara Park Estate. Housing Architect, 94 Chichester St.
Bucks. Erection of infants' school at Bletchley. County Architect, County Offices, Aylesbury.
Bury St. Edmunds. Erection of 44 houses in two lots 24 and 20. Borough Engineer and Surveyor, Borough Offices.
Chadderton U.D.C. Erection of 80 bungalows on the Broadway site. Engineer and Surveyor, Town Hall.
Doncaster T.C. Erection of 43 houses on Western Rd, Cantley Rd, and Intake Estates. Borough Architect.
Dublin, Eire. Erection of 146 houses and E.S.B. substation at Finglas West. City Treasurer, Exchange Bldgs, Lord Edward St.
Essex. Erection of £89,600 primary schools. County Architect, County Hall, Chelmsford.
Holborn. 15 storey office building in High Holborn. Trehearne, N. Preston and Partners, Columbia Hse, Aldwych, W.C.2, are architects.
Holyhead U.D.C. Erection of 14 dwellings at High Terrace and 50 dwellings at Richmond Hill. Clerk to the Council, Town Hall.
Ipswich. Porte and Partners, 16 Devonshire Sq, E.C.2, are architects for £120,000 offices and shops at Princes St.
Isle of Ely. Erection of secondary modern school at Wisbech. County Architect, County Hall, March, Cambs.
Islington. £5,900 lift to be installed at Hillside by L.C.C.
Middlesbrough. Elder and De Pierro, 80 Wimpole St, W.1, are architects for £40,000 Middlesbrough Little Theatre.
Newcastle-on-Tyne. Erection of 26 houses on 4 sites. City Architect, 18 Cloth Market.
Northumberland. Five schools at Ponteland, Morpeth, North Sunderland, Alnwick and Tweedmouth have been approved for erection this year. Sanction being sought for school at Haltwhistle. County Architect, County Hall, Newcastle-on-Tyne.
Nuneaton T.C. Erection of 65 houses, 16 and 12 cottages on 3 sites. Borough Surveyor, Council House.
Peterborough T.C. Erection of 72 dwellings on Walton Estate. City Engineer and Surveyor, Town Hall.
Also Education Board to complete £60,000 Technical College. Boards Architect, Bridge St. Eastholm secondary modern school, £138,000. City Engineer, Bridge St.
Plymouth T.C. Recommended to apply for sanction to borrow £3,000 for museum lighting improvement.
Redditch U.D.C. Erection of 200 houses at Studley Rd site. Engineer and Surveyor, Council House.
Runcorn R.D.C. Erection of 45 houses on several sites. Engineer and Surveyor, Castle Park, Frodsham, Warrington.
Southwark. £2,075,000 for partial redevelopment Elephant and Castle area approved by L.C.C.
South Shields T.C. Improved electrical installations in 288 houses. Recommend to erect £21,000 factory to be let to Denton and Co.
Stalybridge T.C. Erection of 74 dwellings on Copley Estate. Borough Engineer, Town Hall.
Sunderland. R. T. James and Partners, Clavering Place, Newcastle-on-Tyne, are consulting engineers for Southwick Shipyard modernisation for Austin and Pickersgill Ltd.
Sutton Coldfield. R. E. Hancox, Royal House, South Parade, is architect for factory and offices at Reddicap Hill for Alexander Controls Ltd.
Swanscombe U.D.C. Outline plans approved for 160 dwellings at Betsham Rd and Swanscombe St scheme.
Tottenham T.C. Erection of 56 dwellings in Markfield area. Borough Engineer, Town Hall.
Tyldesley U.D.C. Erection of 58 dwellings. Engineer and Surveyor, Town Hall.
Walsingham R.D.C. Erection of 52 dwellings on various sites. F. M. Dewing, architect, 40 Prince of Wales Rd, Norwich.
Watford T.C. Recommended to invite tenders for £2,000 installation of indirect lighting in Council Offices.
West Hartlepool T.C. Erection of Brierton County Primary School. Borough Architect, Municipal Buildings.

MEETINGS TO NOTE

THURSDAY, 24 MAR.

I.E.E. (S. Western). "Aluminium-Sheathed Cables," P. M. Hollingsworth and P. A. Raine. Elect. Showrooms, New George St, Plymouth, 3 p.m.

I.E.E. (Irish). "Submerged Telephone Repeaters for Shallow Water," R. J. Halsey and F. C. Wright. Trinity College, Dublin, 6 p.m.

NOTTINGHAM ELECTRICAL CLUB. "Electron Microscope," W. J. Lloyd. Reform Club, Victoria St, 7 p.m.

INSTITUTE OF FUEL. "The Calorimeter Building for Research on Domestic Heating at the Fuel Research Station," J. W. McHugo, W. E. B. Shaw and D. Whittaker. Instn. of Civil Engineers, Gt. George St, S.W.1, 5.30 p.m.

FRIDAY, 25 MAR.

I.E.E. (N. Scotland). Faraday lecture: "Courier to Carrier in Communications," T. B. D. Terroni. Caird Hall, Dundee 7 p.m.

I.E.E. (N. Eastern). "Brushless Variable-Speed Induction Motor," F. C. Williams and E. R. Laithwaite. Workington Tech. College, 7 p.m.

I.E.E. (N. Eastern). Annual dinner and dance. Old Assembly Rooms, Newcastle, 7 p.m.

I.E.E. (Rugby). I.E.E./R.E.S. Ball at Chesford Grange Hotel, Kenilworth, 8.30 p.m.

I.E.S. (Bath and Bristol) "Shop and Store Lighting," R. L. C. Tate. Elect. Offices, Old Bridge St, Bath, 7 p.m.

I.E.S. (Birmingham). Meeting at B.T.H. Lecture Theatre, Rugby.

MANCHESTER ASSOC. OF ENGRS. Annual meeting. "Engineering Problems Associated with Production and Operations at Low Temperature," H. E. Charlton. Engrs. Club, Albert Sq, 6.45 p.m.

ELECT. TRADES COMMERCIAL TRAVELLERS ASSOC. (Midlands). Annual ladies' evening at Queens Hotel, Birmingham, 6.45 p.m.

CHELMSFORD ENGRNG. SOC. Conversazione at Cromptons' Social Centre, 7.15 p.m.

INSTN. OF MECHANICAL ENGRS. "Hydraulic Transport of Solids," R. C. Worster and D. F. Denny. 1 Birdcage Walk, S.W.1, 5.30 p.m.

A.S.E.E. (N.W. London). "Industrial Switchgear and Circuit-Breakers." Century Hotel, Forty Ave, Wembley Park, 8.15 p.m.

MONDAY, 28 MAR.

I.E.E. (N. Eastern) "Standardisation of Retail Electricity Tariffs," A. O. Johnson and N. F. Marsh. Neville Hall, Newcastle, 6.15 p.m.

I.E.E. (S. Midland Radio). "Search for, and Salvage of, Comet Aircraft near Elba," Cdr. C. G. Forsberg and G. G. MacNiell. James Watt Inst., Great Charles St, Birmingham, 6 p.m.

I.E.E. (S. Midland). "Britain's Atomic Factories," K. E. B. Jay. Hylton Rd Club, Worcester.

I.E.E. (Western Utilisation). "Navigator and His Instruments," W. L. S. Harrison. S. Wales Inst. of Engrs., Park Place, Cardiff, 6 p.m.

I.E.E. (London Students). "Introduction to the Transistor," A. V. Bryant, Savoy Place, W.C.2, 6.30 p.m.

I.E.S. (Leeds). Annual meeting. N.C.B. film "Buried Treasure." 24 Aire St, 6.15 p.m.

I.E.S. (Leicester). "Use of X-rays in Medicine and Industry," J. E. Hood and G. Whiteley. Elect. Offices, Charles St, 6 p.m.

ROCHDALE ELECT. TRADES TECH. SOC. Annual meeting and conversazione. Electric Hse, Smith St. 7.45 p.m.

FACTORY EQUIPMENT EXHIBN. Opens at Earls Court continuing until 2 Apr.

TUESDAY, 29 MAR.

I.E.E. (E. Midland). "Economics of Low-Voltage Electricity Supplies to New Housing Estates." Gas Offices, Nottingham, 6.30 p.m.

I.E.E. (N.W. Supply). "Proving Performance of Circuit-Breakers, especially those of Large Breaking Capacity," J. H. Christie, H. Leyburn, and J. F. Bird; "New Testing Station for High-Power Circuit-Breakers," J. Christie, H. Leyburn, and R. W. Fenn. Engineers' Club, Albert Sq, Manchester, 6.15 p.m.

I.E.S. (London). Discussion on Home Lighting. 2 Savoy Hill, W.C.2, 6 p.m.

WEDNESDAY, 30 MAR.

I.E.E. (London Radio and Measurements). Joint dinner-dance at Cafe Royal, 7 p.m.

BRITISH INSTN. OF RADIO ENGRS. (London). Discussion on "Maintainability of Service Equipment." School of Hygiene, Keppel St, W.C.1, 6.30 p.m.

THURSDAY, 31 MAR.

I.E.E. (London). "Electrical Energy from Wind," E. W. Golding. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (N. Midland). "Some Design Features of Semi-Outdoor Power Station at Ince," F. H. S. Brown. Elect. Offices, Ferensway, Hull, 7.15 p.m.

I.E.E. (Hatfield). "Speed Control of a.c. Motors for Hoist Motions; Dynabrake and Minispeed Systems," A. D. J. Ratcliffe. Tech. College, 7 p.m.

I.E.S. (Glasgow). Annual meeting. "Plant Cultivation," W. W. Fletcher and J. B. R. Anderson. 39 Elmbank Cresc, 7.30 p.m.

BRITISH INSTN. OF RADIO ENGRS. (N. Western). "Electronic Control of Industrial Production Processes," J. A. Sargrove. Annual Meeting. College of Technology, Sackville St, Manchester, 7 p.m.

FRIDAY, 1 APRIL

I.E.E. (N. Eastern Centre). Informal meeting. Liberal Club, Newcastle upon Tyne, 7 p.m.

I.E.E. (Sheffield Sub-Centre). Annual dinner and dance. Royal Victoria Hotel, Sheffield, 7.30 p.m.

I.E.E. (Southern Centre). "Cold Cathode Valves," J. R. Acton. South Dorset Tech. Coll., Weymouth, 6.30 p.m.

A.S.E.E. Annual dinner. Connaught Rooms, W.C.2.

Gazette Announcements

COMPANIES ACTS

Cox's Radio and Electrical Co., Ltd. Meetings of members and creditors will take place at Lucas, Beardsmore and Co., 1 Islington Rd, Birmingham, on 25 Apr. at 12 noon and 12.15 p.m. resp., to receive liquidator's report.

M.C.L. Electrical Ltd. T. J. M. Macleod of 4 Bucklersbury, Cheapside, London, E.C.4, has been appointed liquidator.

Smith and Russell (Coseley) Ltd. Supplemental dividend of 1s. 2½d. in £. payable on 30 Mar. at Official Receiver's Office, Somerset Hse, 37 Temple St, Birmingham 2.

Final Meeting

Webslight Ltd. Final general meeting will be held at 19 Berkeley St, W.1, on 16 Apr., at 11 a.m., to receive the report of Mr G. R. Porter, Liquidator, on winding up.

BANKRUPTCY ACTS

First Meeting

Stafford. Ronald T. Tisdale, electrical engineer, lately of High St, Gnosall, Stafford. First meeting taking place 26 Mar., at 12 Lonsdale St, Stoke upon Trent, at 11 a.m.

Release of Trustee

Bangor. David L. Smith, electrical engineer, lately of Midland Bank Chambers, Cefn Rd, Old Colwyn. Trustee was R. P. Booth, 5 Rumford Place, Liverpool 3.

Intended Dividends

Birmingham. Stanley Sidwell, electrical engineer, of 51 Islington Row, Birmingham. Last day for receiving proofs, 30 Mar. Trustee is R. K. Clarke, Somerset Hse, 37 Temple St, Birmingham 2.

Stourbridge. Frederick R. A. Lock and Victor C. Lock, electrical engineers trading at Union St, Stourbridge. Last day for receiving proofs, 4 Apr. Trustee is R. K. Clark, Somerset Hse, Temple St, Birmingham.

Yeovil. Simeon H. Hutchings, electrical engineers trading as S. Hutchings and Sons at 76 South Side, and Babylon Hill, Yeovil. Last day for receiving proofs, 2 Apr. Trustee is W. E. Burnley, Bank Chambers, Yeovil.

Liverpool. William R. Eagle, electrical contractor trading at 10 Houghton Chambers, Houghton Place, Liverpool. 1 Apr. is last day for receiving proofs. Trustee is E. S. Browne, C.A., 41 North John St, Liverpool.

Receiving Order

London. Harold Freeman, electrical manufacturer of 7 Cobb Rd, Lyme Regis, Dorset. Date of receiving order, 11 Mar.

TRADE NOTES

Change of Name. The title of the Britannic Electric Cable and Construction Co., Ltd., has been changed to Britannic Cables Ltd.

Changes of Address. The Association of Public Lighting Engineers is now at 17 Victoria St, Westminster, S.W.1. Telephone Abbey 4281.

As from 1 Apr., the Mechanical Thermometer Division of the Cambridge Instrument Co., Ltd., will be at the new factory at Friern Barnet, North Finchley, London, N.12. Telephone Hillside 5016. The company have decided to concentrate at the factory a complete self-contained unit to deal with their various types of thermometers, automatic temperature regulators and pressure and vacuum dial gauges and recorders.

ENGLISH ELECTRIC COMPANY

Increased Production and Turnover

THE 36th annual general meeting of The English Electric Company, Limited was held on March 17 in London. Sir George H. Nelson, F.C.G.I., M.I.MECH.E., M.I.E.E. (chairman and managing director), presided, and in the course of his speech said:

In view of the great potential development throughout the world in the applications of electric power and other developments in the many fields in which your company is engaged, the directors feel it is necessary to have facilities available to deal at short notice with such expansions that may be open to them and recommend that the authorised capital of the company be increased to £25,000,000 by the creation of a further 10,000,000 Ordinary shares of £1 each.

The chairman, in the course of his review of the outstanding engineering achievements during 1954, said:

Power Generation Equipment

Our contribution—by plant commissioned during the year—to the world's hydro-electric power capacity is some half million kW, made up by 12 turbines and 14 alternators in Portugal, Spain, Scotland, Canada, Rhodesia, New Zealand and India. Apart from our success in obtaining orders in the U.S.A. which is so important to Great Britain because of its dollar earnings, I would like to mention two outstanding achievements in this field during the year. As a direct result of advanced research in hydro dynamics, carried out in the great extensions of our hydraulic laboratories at Rugby, our group was awarded, against intense competition, an order for Canada for six 53,500 h.p. pump turbines of an entirely new type for Niagara Falls.

In the steam turbine field we have installed and taken orders for a wide variety of different sets, but the most technically advanced unit commissioned during the year is the second 60,000 kW set in the Stourport "B" power station of the British Electricity Authority. This is the first set operating in this country with steam conditions of 1,500 lb/sq in. and 1,050° F.

As a result of several years of careful research and development on the problems associated with building the biggest steam turbine alternators, the British Electricity Authority have recently placed with us an order for two—100,000 kW sets and the technical features of our offer have resulted in their ordering the first 200,000 kW set to be placed in this country, which, in fact, will be the largest ever built here.

More than half the power station plant orders received in 1954 are for export.

Research and development has continued vigorously in the power transmission and switchgear distribution equipment field to meet the ever more stringent and higher voltage demands of power networks.

Power Utilisation Equipment: During the past year the company has maintained a high activity in all forms of electrical equipment associated with the industrial use of electrical power.

Finally, in the domestic field, our production and sales of appliances and television receivers during 1954 were at a high level. The report was adopted.

MARCONI'S WIRELESS TELEGRAPH

Record Turnover

THE fifty-seventh annual general meeting of Marconi's Wireless Telegraph Company, Ltd., was held on 17 March in London.

Sir George H. Nelson (the chairman), in the course of his speech, said: Last year's record turnover has been exceeded this year. The net profit for the year is £420,373, which shows an increase of £124,384 on the net profit of the previous year. Your directors recommend a dividend of 10 per cent, less tax, on the Ordinary shares.

Radio Communications: Your company is, in certain fields, the largest single manufacturer and supplier of radio communication equipment in the world.

In collaboration with the Canadian Marconi Co., the control of which we acquired in 1953, we have obtained a very important telecommunication order which will make a valuable contribution to the country's dollar receipts. The new stations will give Canada a greatly improved radio telephone service with Australia, New Zealand and the Far East, and will give Britain an alternative to existing radio telephone links with Australia when the new Trans-Atlantic cable is completed.

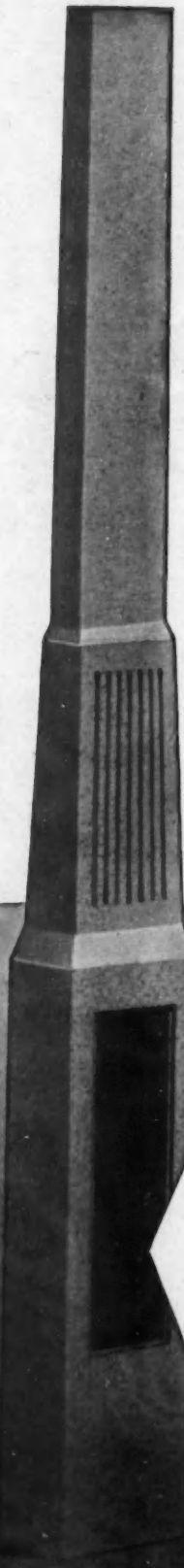
Television: It is heartening to be able to say that we have received orders for black and white television equipment far exceeding anything received in previous years. Export orders include the first three transmitting stations in Denmark, additional equipment for Pisa and Rome in Italy and an installation in Brazil.

Colour Television: An event of major importance took place in May last year when your company gave the first public demonstration in this country of a fully electronic compatible colour television system. It must be apparent to all who have studied the technical and economic problems involved that the ultimate choice of a system of colour television for any country must rest with those Authorities whose responsibility it is, but I would say, however, that Marconi's Wireless Telegraph Company has, by extensive research, gathered a wealth of experience and is ready to advise and co-operate with the Authorities who have this problem to face, and to develop and manufacture equipment to comply with the standards they choose.

Sound Broadcasting: While television has captured the public interest, it is a fact that the great majority of people throughout the world will for many years to come still rely on sound broadcasting for their entertainment and enlightenment. Our high power broadcasting transmitters, which have this year gone into operation in Norway and Denmark, and will soon be in service in Cyprus, the Sudan and Argentina, now bring the total of these large transmitters sold throughout the world to forty-one.

Defence Radar: When the story comes to be told of the part your company has played in re-equipping the radar defences of this country it will be a revelation.

The report was adopted.



HENLEY

IRONCLAD SERVICE FUSES

DOUBLE-POLE

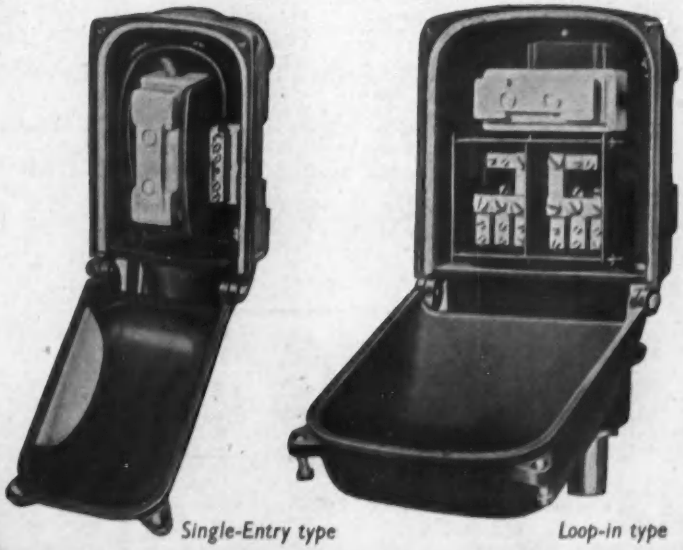
for use in lighting columns

These HENLEY Ironclad Service Fuses are designed specially for use in columns for outdoor lighting installations. Both are fitted with a fuse and neutral and suitable for maximum working current of 15 amp. The fuse can be supplied suitable for cartridge fuse-links or, alternatively, for wire fuse-elements.

STREET LIGHTING · FACTORY YARDS
CAR PARKS · RACETRACKS · FAIR GROUNDS
EXHIBITIONS · SPORTS ARENAS · FLOODLIGHTING

Compact · Robust

Write for Folder 49/A



Single-Entry type *Loop-in type*

W. T. HENLEY'S TELEGRAPH WORKS CO., LTD. 51-53 HATTON GARDEN, LONDON, E.C.1

Skill is not enough, sound jointing demands FRY'S solders. For that smooth buttery consistency that means easy application it pays to specify solders by FRY'S. Pure, and rich in tin, the ABBEY and BELFRY brands ensure sound joints for all types of cable work. *Export enquiries invited.*

FRY'S Metal Foundries Limited

Tandem Works, Merton Abbey, London, S.W.19 Tel: MITcham 4023

And at MANCHESTER · GLASGOW · BRISTOL · DUBLIN

45/2

CLASSIFIED ADVERTISEMENTS

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 32s. 6d. per inch, and all other classified advertisements at 2s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

TENDERS INVITED

BOROUGH OF NEWCASTLE-UNDER-LYME

TENDERS are invited for the following separate contracts for the installation of Group "A" Lighting.

CONTRACT NO. 16

Clayton Rd, Newcastle, Route A.519 (approximate length 1·5 miles).

This contract is for the supply and installation of lanterns, lamps, control gear and concrete standards, the type of lighting specified being 140 W Horizontal Burning Sodium Vapour Discharge Lamps.

CONTRACT NO. 17

High St, Knutton, Route No. B.5367 (approximate length 570 yds).

This contract is for the supply and installation of lanterns, lamps, time switches and concrete standards, the type of lighting specified being 250 W Horizontal Burning Mercury Vapour Discharge Lamps. The choking coils and condensers will be supplied by the Corporation from stock, having been previously supplied by The British Thomson-Houston Co.

Plans may be inspected and tender documents obtained from the Borough Engineer, Lancaster Building, High St, Newcastle, Staffs. Deposit £2 per Contract.

Tenders must be endorsed with the appropriate Contract number and must be received by me not later than the first post on 12 Apr., 1955.

C. J. MORTON,
Town Clerk.

District Bank House,
Newcastle, Staffs. (R 281)

CITY OF MANCHESTER
Housing Committee

TENDERS are invited for the Electrical Installations to 68 Maisonnettes and Flats—Contract 222—Ridgway St, Ancoats.

Tender Forms and Schedules may be obtained from the Director of Housing, Town Hall, Manchester 2, and must be returned in a sealed official envelope endorsed "Electrical Installations," to be received at the office of the Town Clerk not later than 12 noon on Thursday, 31 Mar., 1955.

PHILIP B. DINGLE,
Town Clerk.
(R 271)

GOVERNMENT OF KUWAIT
Department of Electricity

33 KV TRANSMISSION SYSTEM

TENDERS are invited for the supply, delivery to site and complete installation of 20,000 yards of 3-core 0·4 sq in. oil filled paper insulated cable and associated pilot cable for use on the 33 kV Transmission System. Tender documents will be available in Kuwait on 14 Apr., 1955. A single copy of the tender documents, reference 5305/E.1, must be obtained from the President of the Department of Electricity, Government of Kuwait, Kuwait, Arabia, and will only be available to recognised and accredited Kuwaiti Agents. The necessary additional copies of the tender documents will be issued by the Consulting Engineers in

continued in next column

continued from previous column

London on receipt of the Authorisation form from the Government of Kuwait. Notice of the foregoing will be posted on the Notice Board of the Department of Electricity in Kuwait on 1 Apr., 1955. Tenders must be submitted to the President of the Department of Electricity by 9 June, 1955.

Ewbank and Partners Limited,
Engineering Consultants.

10/11 Grosvenor Place,
London, S.W.1. (R 280)

WALTHAM HOLY CROSS URBAN DISTRICT COUNCIL

CLASS "A" SODIUM LIGHTING TO A SECTION OF A.112 AND B.194

TENDERS are invited for the supply, erection and wiring of 50 concrete columns to take Class "A" sodium lighting.

Contractors wishing to tender should send their names to the undersigned not later than 31 Mar., 1955.

The Council does not bind itself to accept the lowest or any Tender.

H. J. CHAPMAN,
Clerk to the Council.

Town Hall,
Waltham Abbey.
18 Mar., 1955. (R 305)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18–64, or a woman aged 18–59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

SOUTH WESTERN ELECTRICITY BOARD

DEMONSTRATOR—EAST CORNWALL DISTRICT (LISKEARD)

SALARY N.J.C., Grade 1—£425/£525 per annum.

Duties include public demonstrations of cooking and electrical appliances, and advice generally on their use. Candidates should possess recognised domestic science qualification, with preferably E.A.W. Electrical Housecraft Certificate.

Application forms obtainable from the Manager, Cornwall Sub-Area, Pool, Redruth, Cornwall, should be returned by 5 Apr., 1955. (R 296)

NORTH WESTERN GAS BOARD
Liverpool Group

INSTRUMENT ENGINEER—GARSTON WORKS, LIVERPOOL

APPLICATIONS are invited for the above pensionable appointment at a salary within the Grades A.P.T. 5/6 (£500/£610 per annum).

The person appointed will be responsible for the maintenance and installation of a wide range of instruments. Considerable industrial experience, preferably as a service engineer and/or a Higher National Certificate are desirable.

Applications should be made on the official form obtainable from the Chief Personnel Officer, N.W.G.B. (Liverpool Group), Radiant House, Bold St, Liverpool 1, and returned to him within 14 days. (R 276)

THE NORTH WESTERN ELECTRICITY BOARD

APPOINTMENT OF ENGINEERING DRAUGHTSMAN (BUILDING) SUB-AREA ENGINEER'S DEPARTMENT, HAZEL GROVE

APPLICANTS should have experience in the preparation of working drawings for alterations to offices, service centres and electricity substations, etc. Some knowledge of quantities and the preparation of specifications will be considered an advantage.

Salary Scale: £510 x £20—£630 per annum Schedule D, Grade 6, N.J.B. Conditions.

APPOINTMENT OF FITTERS (ELECTRICAL)

(*a*) MACCLESFIELD AND NEW MILLS DISTRICTS.

(*b*) ROMILEY DEPOT.

Applicants for posts (*a*) should be experienced in the erection and maintenance of E.H.T. and L.T. Switchgear, Transformers and ancillary substation equipment.

Applicants for post (*b*) should be experienced in Transformer maintenance and a knowledge of coil winding will be an advantage.

Rate of pay: 49d. per hour, N.J.I.C. Conditions.

Application forms for the above posts can be obtained from Sub-Area Manager, No. 7 Sub-Area, The North Western Electricity Board, Chapel St, Hazel Grove, Cheshire, and must be returned to him by 2 Apr., 1955. (R 284)

BRITISH ELECTRICITY AUTHORITY
North Eastern Division

APPLICATIONS are invited for the appointment of a GENERAL ASSISTANT ENGINEER (Telecommunications) in the Technical Engineers Department, Newcastle upon Tyne.

Applicants should have had experience in the installation and maintenance of automatic and voice frequency telephone equipment, and the technical qualifications of Graduate I.E.E. standard are desirable.

The salary for this appointment (which is superannuable) will be in accordance with the National Joint Board Agreement, Grade 6, Schedule C (£600/£785) per annum and will commence at a point commensurate with qualifications and experience.

Forms of application may be obtained from the Divisional Establishments Officer, British Electricity Authority, North Eastern Division, Carliol House, Newcastle upon Tyne, to whom they should be returned to arrive not later than 14 Apr., 1955. (R 272)

WORKS SUPERVISOR

required by the NYASALAND GOVERNMENT PUBLIC WORKS DEPARTMENT for one tour of 2/3 years with prospect of permanency. Salary scale (including present temporary allowance of approx. 13% of salary) £747 rising to £1,103 a year. Outfit allowance £30. Free passages. Candidates age 25 to 40 must have served a regular apprenticeship as an Electrician and be capable of installing and testing motors up to 25 h.p. and of carrying out wiring installations for domestic and commercial buildings to I.E.E. wiring regulations. They must be able to lay out domestic and small industrial installations, to read diagrams and to test for and localise faults.

Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2A/40704/EE. (R 279)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD
Aberdeen Steam Station

APPLICATIONS are invited for the position of ASSISTANT SHIFT CHARGE ENGINEERS at the appropriate salary on the N.J.B. Schedule A, Grade 9, Class F (£675 x £15—£720).

A sound technical training and practical experience in the operation and/or maintenance of steam generating plant and Main Switchgear are required although consideration will be given to applicants with suitable other qualifications.

Applications should reach the undersigned within 14 days of the appearance of this advertisement.

J. E. WHITTAKER,
Area Manager.

Area Offices,
Millburn St, Aberdeen.
16 Mar., 1955. (R 285)

BRITISH ELECTRICITY AUTHORITY
London Division

APPLICATIONS are invited for the following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A. Salary includes London Allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E., an advantage.

ASSISTANT MAINTENANCE ENGINEER (MECHANICAL) BANKSIDE GENERATING STATION

Vacancy No. 55/224

Practical training necessary on modern large capacity boilers, turbines and auxiliary plant. Salary—Class H, Grade 10= £750. 15s. per annum.

ASSISTANT ENGINEER (TECHNICAL) BANKSIDE GENERATING STATION

Vacancy No. 55/225

Successful candidate will be responsible for compilation of statistics and general technical duties. Salary—Class H, Grade 14 =£582. 15s. per annum.

ASSISTANT ENGINEER (ELECTRICAL TEST) FULHAM GENERATING STATION

Vacancy No. 55/226

Candidates should have had a sound technical training and practical experience in the testing and routine maintenance of Generating Station electrical equipment including Generators, Switchgear, Transformers, Motors and associated protective equipment is essential. Salary—Class K, Grade 18= £500 per annum.

Applications, quoting vacancy number, may be made on form obtainable from Divisional Secretary, British Electricity Authority, London Division, P.O. Box 136, Generation House, Great Portland St, W.1, and be received within 14 days of this advertisement. (R 294)

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:

Suffolk Sub-Area

GENERAL ASSISTANT ENGINEER (PLANNING AND DEVELOPMENT) 47/55.R.

Candidates should have had a sound technical training and experience in the design, layout and operation of urban and rural distribution systems at voltages up to 33 kV.

Salary in accordance with Class J, Grade 13 of the National Joint Board Agreement, commencing at £635.

Apply to the Manager, Suffolk Sub-Area, Eastern Electricity Board, Finborough Hall, Stowmarket, Suffolk.

Area Headquarters

SENIOR ASSISTANT ENGINEER (DEVELOPMENT) 49/55.N.

Candidates should have had experience in rural electricity supply; should preferably have had agricultural training and/or experience; must be familiar with latest electrical applications in the field of agriculture and horticulture; and be able and used to training staff in such matters as well as addressing audiences.

The post in the Development section of the Chief Commercial Officer's department, will carry responsibility for maintaining an increased rate of development of utilisation among agricultural and horticultural consumers.

Salary in accordance with Grade I, Class AX/DX (£1,100/£1,315) under the National Joint Board Agreement, entry to be at a point consistent with knowledge and experience.

Apply to the Chief Commercial Officer, Eastern Electricity Board, Wherstead, Ipswich, Suffolk.

Future salary and conditions of service for these appointments will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Applications by letter, stating age, education, qualifications and experience, with details of present appointment and salary, should be submitted to the Manager concerned within fourteen days of the appearance of this advertisement. (R 321)

ASSISTANT CHIEF ENGINEER

APPLICATIONS are invited for the post of Assistant Chief Engineer (Mechanical and Electrical) for the Nigerian Ports Authority. The Authority was recently created as a Public Corporation and offers good prospects.

Candidates (who must be no more than 38 years of age) must be corporate members of the Institution of Electrical Engineers and/or the Institution of Mechanical Engineers. The person appointed will be directly responsible to the Chief Engineer for the mechanical and electrical side of the Engineering Department. This includes the maintenance and technical control of a large fleet of cargo handling appliances, dockside cranes, diesel shunting engines and motor transport. Some knowledge of telecommunications and R.T. would be an advantage.

The Authority's interests include the operation of all ports and waterways in Nigeria. The successful candidate will, therefore, be required to undertake periodical visits to its various stations throughout the country.

The salary will be at the consolidated rate of £2,000 p.a. which figure includes an element for Overseas pay.

Appointment will be for one tour of 10 to 18 months in the first instance, thereafter, subject to satisfactory service, employment will be offered on a permanent basis and officers will be required to join the Authority's Pension Scheme or Provident Fund. It may be possible to preserve existing pension rights. Free first class return passages for officer and wife and assistance towards cost of, up to two, children's passages or an allowance in lieu thereof. Partly furnished quarters provided at rent of 10% of salary (maximum £150 a year). Outfit allowance £60. Leave on full salary at rate of 7 days for each month's service. Free medical services. Car allowances payable and loans for car purchase in approved cases.

Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2A/40490/EE. The closing date for applications is 30 Apr., 1955. (R 303)

BRITISH ELECTRICITY AUTHORITY
North West, Merseyside & N. Wales Division

VACANCY No. E.94/98/T.—STATION CHEMIST, Carrington Generating Station. Salary £840/£900 (H.7).

Vacancy No. E.94/99/T.—MAINTENANCE ENGINEER (Elec.), Hartshead Generating Station, Stalybridge. Salary £840/£900 (G.6).

Vacancy No. E.94/100/T. — SHIFT CHARGE ENGINEER, Barton Generating Station, Manchester. Salary £840/£900 (H.7).

Vacancy No. E.94/101/T. — SHIFT CHARGE ENGINEER, Leigh Generating Station. Salary £595/£640 (B.7).

Vacancy No. E.94/102/T. — SHIFT CHARGE ENGINEER, Bury Generating Station. Salary £715/£760 (E.7).

Apply to Divisional Secretary, British Electricity House, 825 Wilmslow Rd, Manchester 20, before 20 Apr. Quote Vacancy No. (R 293)

NATIONAL COAL BOARD

invite applications for a superannuable appointment as ASSISTANT POWER GENERATION ENGINEER (Mechanical) in the Production Engineering Branch at London Headquarters. Applicants must have experience in the design and construction or operation of steam power plants, and preferably some knowledge of gas turbines. Experience in the preparation of specifications and the negotiation of contracts is desirable. Appointment will be, according to qualifications and experience, in the present salary range £650 to £1,250, which is now under review.

Write, giving full particulars (in chronological order) of age, education, qualifications and experience (with dates) to National Coal Board, Establishments (Personnel), Hobart House, Grosvenor Place, London, S.W.1, marking envelope TT/947. Original testimonials should not be forwarded. Closing date 14 Apr., 1955. (R 275)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments, which are superannuable and subject to medical examination. Candidates should preferably have the technical qualifications to enable them to become Chartered Electrical Engineers.

1. SECTION ENGINEER in the No. 1 Sub-Area, Liverpool Central District. Salary £840/£900 per annum (N.J.B. H/7).
   Applicants should have had experience in the construction, operation and maintenance of systems up to and including 33 kV.
   Special forms of application obtainable from the Manager, No. 1 Sub-Area, 24 Hatton Garden, Liverpool 3. Closing date: 4 Apr., 1955.
2. FIRST ASSISTANT DISTRICT ENGINEER in the No. 4 Sub-Area, Anglesey District, based on Llangefni. Salary £755/£800 per annum. (N.J.B. D/5).
   Applicants should have experience in the construction and operation of E.H.T., H.T. and L.T. overhead and underground distribution systems, including indoor and outdoor substation equipment.
3. ASSISTANT SECTION ENGINEER in the No. 4 Sub-Area, based on Crewe. Salary £635/£680 per annum (N.J.B. E/9).
   Applicants should have had experience of H.V. and M.V. overhead and underground distribution work.

Application forms for posts 2 and 3 obtainable from the Manager, No. 4 Sub-Area, Electricity House, Rhostyllen, near Wrexham. Closing date: 4 Apr., 1955. (R 274)

CITY OF BULAWAYO
(Southern Rhodesia)

VACANCIES FOR ENGINEERS: ELECTRICITY DEPARTMENT

APPLICATIONS are invited for the tion of Generation Engineer (Gross annual emoluments £1,504 rising to £1,729. 12s.), one position of Senior Engineering Assistant (Gross annual emoluments £1,259. 12s. rising to £1,447. 12s.) and four positions of Electrical and/or Mechanical Engineers (gross annual emoluments, depending on qualifications of persons appointed, extending from a minimum of £883. 12s. to a maximum of £1,334. 16s.).

In addition to the above figures, children's allowances of £30 a year for the first child and £24 a year for each of the second and third children are payable.

Further details of the vacancies, including information relating to the refund of travelling expenses, may be obtained from the Council's London Agents, Davis and Soper Ltd., 52 and 54 St. Mary Axe, London, E.C.3. Applications must reach the "Staff Vacancies Officer, Town Clerk's Department, P.O. Box 591, Bulawayo, Southern Rhodesia," by 11 Apr., 1955.

E. S. WHITE,
Town Clerk

11 Mar., 1955. (R 260)

BRITISH ELECTRICITY AUTHORITY
Midlands Division

APPLICATIONS are invited for the following positions in the Generation (Operation) Department. N.J.B. service conditions, superannuable appointments, salaries within Schedule A of the Agreement:

(*a*) STATION SHIFT CONTROL ENGINEER at Nechells "A" Power Station, Grade F10, commencing at £635 per annum. (Vacancy No. 915MD.)

(*b*) ASSISTANT ENGINEER at Hams Hall "B" Power Station, Grade K12, commencing at £715 per annum. (Vacancy No. 916MD.)

Applicants for these positions should have received a sound technical training and practical experience, in particular for (*a*) in the control of steam generating plant and main switchgear, and for (*b*) in the control of the works supply system. Appropriate technical qualifications will be an advantage.

Apply, quoting the vacancy number, on form AE6, available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 9 Apr., 1955. (R 301)

BRITISH ELECTRICITY AUTHORITY
South Wales Division

Vacancy No. 32/55

APPLICATIONS invited for superannuable N.J.B. appointment of SHIFT CHARGE ENGINEER at Carmarthen Bay Power Station.

Salary: K.7, £975 x £25 to £1,050.

Applicants should have obtained H.N.C. and served a regular apprenticeship. Operating experience in a modern power station essential.

Application forms obtainable from Secretary, South Wales Division, British Electricity Authority, Twyn-y-Fedwen Rd, Gabalfa, Cardiff, to be returned by 4 Apr., 1955. (R 317)

BRITISH ELECTRICITY AUTHORITY
East Midlands Division

APPLICATIONS are invited for the following positions within the Division:

STATION SUPERINTENDENT
LEICESTER POWER STATION

Vacancy No. 51/55/ET

In addition to having served a recognised engineering apprenticeship, applicants must have had a wide experience of the operation, maintenance and administration of a large modern Generating Station, and should preferably be Corporate Members of a recognised professional Institution or hold equivalent qualifications.

The salary will be in accordance with the National Joint Managerial and Higher Executives Salary Scale 2 (£1,300/£1,450 per annum).

Closing date for receipt of applications, 8 Apr., 1955.

SHIFT CHARGE ENGINEER
DRAKELOW POWER STATION

Vacancy No. 50/55/ET

Applications are invited from suitably qualified engineers having had operating experience with large capacity high pressure turbo-alternators and pulverised fuel fired boilers.

Applicants should be in possession of technical qualifications admitting to Corporate Membership of the Institution of Electrical Engineers and/or the Institution of Mechanical Engineers.

Apprenticeship at a large manufacturing works will be an advantage.

Salary will be in accordance with Class J, Grade 7 (£900 x £25—£975 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 8 Apr., 1955.

ASSISTANT SHIFT CHARGE ENGINEER
AVON POWER STATION, WARWICK

Vacancy No. 49/55/ET

Applicants should hold the Higher National Certificate or equivalent qualification and have had experience in Power Station Operation.

Salary will be in accordance with Class E, Grade 9 (£635 x £15—£680 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 8 Apr., 1955.

SHIFT CONTROL ENGINEER
LINCOLN POWER STATION

Vacancy No. 55/55/ET

Applicants should have had a sound training and practical experience in a modern Power Station. The possession of a Higher National Certificate in Electrical Engineering, or its equivalent, would be advantageous.

Salary will be in accordance with Class E, Grade 10 (£595 x £15—£640 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 8 Apr., 1955.

These appointments will be pensionable within the terms and provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form A.E.6/ACT which may be obtained from the Divisional Establishments Officer, British Electricity Authority, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote Vacancy Number.

L. F. JEFFREY,
Divisional Controller.

18 Mar., 1955. (R 295)

SOUTH EASTERN ELECTRICITY BOARD

ASSISTANT DISTRICT ENGINEER—SUTTON DISTRICT

SALARY £755/£800 per annum under N.J.B. Class F, Grade 7, plus London Allowance. Superannuable.

Applicants, preferably Corporate Members of the Institution of Electrical Engineers, should have extensive experience and responsible practice in distribution works in thickly populated urban areas with voltages up to 33 kV.

Applications, naming 2 referees, on forms from W. B. Hayden, M.I.E.E., District Manager, SEEBoard, 52/54 High St, Sutton, Surrey, by 6 Apr., 1955.

DEMONSTRATOR/SHOWROOM ASSISTANT (FEMALE)—WOKING DISTRICT

Salary £525 x £20—£585 per annum under N.J.C. agreement, Grade 2. Superannuable.

Applicants should have showroom experience and be capable of demonstrating electrical appliances both in showrooms and on consumers' premises. Possession of an E.A.W. certificate will be an advantage.

Applications, naming 2 referees, on forms from J. C. Poole, A.M.I.E.E., District Manager, SEEBoard, 4 Chobham Rd, Woking, Surrey, by 6 Apr., 1955.

SHOWROOM ASSISTANT (MALE)—SUTTON DISTRICT

Salary within range £170/£410 per annum or £190/£495 per annum plus London Weighting according to age and experience. New entrants for the higher scale must have obtained the General Certificate of Education at ordinary level in at least four subjects including English and Mathematics. Superannuable.

Applicants should preferably have experience in dealing with showroom enquiries and sales of electrical appliances. The person appointed must be prepared to work in any of the Sutton district showrooms.

Applications, naming 2 referees, on forms from W. B. Hayden, M.I.E.E., District Manager, SEEBoard, 52 High St, Sutton, Surrey, by 6 Apr., 1955.

A. L. BURNELL,
Secretary.

18 Mar., 1955. (R 297)

SOUTHERN ELECTRICITY BOARD

SURVEYOR

SUB-AREA Office, No. 3 (Portsmouth) Sub-Area. Salary N.J.C. Grade 2 (£525/£585 per annum). N.J.C. Conditions of Service.

Applicants should have a sound knowledge and experience of general survey work with ability to peg overhead lines and prepare profiles and plans from surveyed elevations.

The successful candidate will be required to contribute to the B.E.A. and Area Boards' Superannuation Scheme, if eligible.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him in envelopes suitably endorsed not later than 8 Apr., 1955. (R 302)

SAO PAULO LIGHT AND POWER
Company Limited, Brazil

invite applications from suitably-qualified single men for the position of ASSISTANT SHIFT CHARGE ENGINEER in the Piratininga Power Station. The power station which has recently been completed is situated near Sao Paulo (pop. 2·5 millions; temperate climate; 2,200 ft above sea level). The plant comprises 2 x 80 MW, 1,800 r.p.m. steam turbo-alternator units, each supplied at 850 psi, 900° F by one 850,000 lb/hr oil-fired boiler. Applicants should have sound technical knowledge based on complete engineering course and practical training, including two or three years' apprenticeship in a modern steam plant followed by at least one year's experience as assistant shift charge engineer, or the marine equivalent. Good salary, three years' agreement subject to renewal with first class passage both ways; four months' paid leave after three years' service. Written application should be made to Mr W. P. Kellett, Joint Manager, Canadian-Brazilian Services Ltd., 148 Leadenhall St, London, E.C.3. (R 202)

THE UNITED KINGDOM ATOMIC ENERGY AUTHORITY
Aldermaston, Berks

requires a number of DESIGN ENGINEERS to lead groups engaged upon the design and development of electrical/electronic engineering requirements.

Applicants should possess a Degree, preferably with Honours, in Electrical Engineering, or Electrical (Telecomms) and have had considerable workshop experience. They should have had a number of years' experience in electrical/electronic design, and should have been in control of complete projects, and have carried them through to the final stage. A high standard of technical judgment is essential and initiative, drive and adaptability is required.

The salary will be up to £1,500 per annum (male) according to qualifications and experience. Successful candidates will be required to join the Authority's contributory superannuation scheme.

Housing accommodation will be available within a reasonable period for married staff who live outside the radius of the Establishment's transport facilities.

Send postcard for application form to Senior Recruitment Office, A.W.R.E., Aldermaston, Berks. Quote Ref. 566/WGE/49. (R 273p)

SOUTH WALES ELECTRICITY BOARD

APPLICATIONS invited for the position of ASSISTANT ENGINEER, District 462, Newport, Eastern Sub-Area.

Applicants should have had a sound technical training and experience in the construction, operation and maintenance of H.V. and L.V. O/H and U/G cables and Substations in a predominantly urban area. Duties will include the preparation of schemes, estimates and contract schedules for projects of all types.

Salary for position Class F, Grade 7 (£755/£800) of the N.J.B. Schedule.

Applications, stating age, present position, salary, qualifications, experience and three referees, to be addressed to the Secretary to arrive by 2 Apr., 1955.

D. G. DODDS,
Secretary.

St. Mellons,
Cardiff. (R 299)

BRITISH ELECTRICITY AUTHORITY
South Eastern Division

THIRD ASSISTANT ENGINEER in the Technical Department based at Croydon. Applicants should possess Higher National Certificate in Electrical Engineering or equivalent qualification. Experience essential in the installation and maintenance of all types of automatic protective gear; commissioning tests on alternators, transformers and switchgear, fault investigations and preparation of reports. Class AX/DX, Grade 3—£875/£1,000 per annum plus London Allowance.

ASSISTANT ENGINEER (Works Office Co-ordination) for Brighton "A" and "B" Power Stations. The position requires a person having foresight with an analytical mind coupled with initiative to co-ordinate the operation and maintenance activities of a modern Power Station. Applicants should have experience of both these activities and preferably possess membership of either the Institution of Mechanical or Electrical Engineers. Class L, Grade 7—£1,035/£1,125 per annum. N.J.B. Conditions for both positions. Applications giving details of education, present position, experience, etc., should be received by the Establishments Officer, British Electricity House, Lower Ham Rd, Kingston-upon-Thames, Surrey, or the Station Superintendent, Brighton "A" and "B" Power Stations, Portslade by Sea, Sussex, according to the location of the vacancy, by 4 Apr., 1955. (R 319)

SOUTH WALES ELECTRICITY BOARD

APPLICATIONS invited for the position of CHIEF ENGINEERING DRAUGHTSMAN in the Western Sub-Area, Tenby.

Duties will include responsibility for the organisation and supervision of the Sub-Area Drawing Office and the training of juniors.

Salary for position Grade 4, Schedule D (£750/£850) of the N.J.B. Schedule.

Applications, stating age, present position, salary, qualifications, experience and three referees, to be addressed to the Secretary to arrive by 2 Apr., 1955.

D. G. DODDS,
Secretary.

St. Mellons,
Cardiff. (R 300)

BRITISH ELECTRICITY AUTHORITY
Eastern Division

APPLICATIONS are invited for the following post:

JUNIOR ENGINEER
CLIFF QUAY GENERATING STATION

Salary Class K, Grade 18, £475 x £15—£520 per annum.

The duties of the successful applicant will include assisting in the Control Room on shift and other operation and investigation duties. Preference will be given to applicants who have had previous experience in a Generating Station and who have reached the standard of the Ordinary National Certificate in Electrical Engineering or its equivalent.

Applications stating age, qualifications and experience should be sent to the Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, N.14, to arrive not later than 2 Apr., 1955.

W. N. C. CLINCH,
Controller.
(R 278)

THE UNITED KINGDOM ATOMIC ENERGY AUTHORITY
A.E.R.E., Harwell, Berks

has a vacancy for an
ENGINEER

to develop new types of instruments and applications of existing industrial process instruments for use on a wide variety of recording and control applications at Atomic Energy Research Establishment. Applicants should have served a recognised engineering apprenticeship and be at least graduate members of either the Institute of Electrical Engineers or Institute of Mechanical Engineers. Possession of an Honours degree would be an advantage. They should also have a sound knowledge of modern instrument measurement and control techniques, and some years experience in instrument applications is desirable. The successful candidate will be appointed in the grade of Engineer III within the salary scale £695 (at age 25)—£1,065 per annum according to age, qualifications and experience, and will be required to join the Authority's contributory superannuation scheme. Applications should be sent to the Establishments Officer, A.E.R.E., Harwell, Didcott, Berks, quoting reference 2/103/277. (R 322)

SOUTH WALES ELECTRICITY BOARD

APPLICATIONS invited for positions of ASSISTANT DISTRIBUTION CONTROL ENGINEERS (Shift Duties), two at each of the Board's Control Centres at Upper Boat and Manselton.

Duties will involve assisting the Control Engineer (Shift) in the operation of an extensive overhead and underground high voltage network, and applicants should have experience in the operation of switchgear and all voltages, transformers and associated protection equipment and be familiar with the working of the Safety Rules.

Salary for the positions, Class AX/CX 5 (£675/£840) of the N.J.B. Schedule.

Applications, stating age, present position, salary, qualifications, experience and three referees, to be addressed to the Secretary to arrive by 2 Apr., 1955.

D. G. DODDS,
Secretary.

St. Mellons,
Cardiff. (R 298)

THE UNITED KINGDOM ATOMIC ENERGY AUTHORITY

requires at its Nuclear Power Station, Calder Works, Cumberland: (REF. 868) SHIFT CONTROL ENGINEERS, to be responsible to a Power Manager for the operation and control of conventional steam turbo-alternator plant, auxiliaries and switchgear. Previous experience of steam power generation essential. Salary £710 (at age 30)—£830.

(REF. 869) FOREMEN (Electrical Control) for shift control of a conventional electrical system. Control experience on steam power generating plant essential. Salary £575 (at age 26)—£715.

A recognised engineering apprenticeship is essential for each of these posts, and possession of a National Certificate would be an advantage. The successful applicants will be required to join the Authority's contributory pension scheme.

Applications to The Works Secretary, Windscale Works, Sellafield, Cumberland, quoting the appropriate reference. (R 277)

BRITISH ELECTRICITY AUTHORITY
Southern Division

APPLICATIONS are invited for the following post:

CLERICAL ASSISTANT (GRADE 3)
POOLE GENERATING STATION
S/13.641

Wide experience of preparation of wages sheets, P.A.Y.E., and superannuation and other deductions is necessary, and general experience of work in a generating station is desirable.

Applicants should have had a sound general education, and preference will be given to those studying for or possessing a recognised professional qualification.

Salary N.J.C. Grade 3, £585 x £20—£645.

Special application forms, obtainable from P. D. A. Oliver, Divisional Secretary, 111 High St, Portsmouth, should be returned by 6 Apr. Please quote reference E.T. (R 316)

YORKSHIRE ELECTRICITY BOARD
No. 1 (Bradford) Sub-Area
Bradford District
THIRD ASSISTANT DISTRICT ENGINEER

APPLICANTS should have passed the Graduateship Examination of the Institution of Electrical Engineers or hold equivalent technical qualifications, have substantial experience in construction, operation and maintenance of high voltage systems, underground cables, and overhead lines and substations, and medium and low voltage networks, preferably including direct current systems.

Candidates must be prepared to reside within the District and undertake standby duties, if required.

Salary—N.J.B. Class J, Grade 9 £790/£20/£850 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 1 (Bradford) Sub-Area, Yorkshire Electricity Board, 45-53, Sunbridge Rd, Bradford, not later than 7 Apr., 1955.

No. 7 (Grimsby) Sub-Area
Grimsby District
SECOND ASSISTANT DISTRICT ENGINEER

Applicants should preferably be Corporate Members of the Institution of Electrical Engineers, or hold equivalent qualifications. They must have had a sound training and extensive experience in the design, construction, operation and maintenance of H.V. and L.V. Underground and Overhead distribution systems, both in urban and rural areas, substation plant and ancillary equipment.

Salary—N.J.B. Class F, Grade 7, £755/£15/£800 per annum.

THIRD ASSISTANT DISTRICT ENGINEER

Applicants must possess at least the Higher National Certificate in Electrical Engineering, and should have experience in the design, construction, operation and maintenance of H.V. and L.V. Overhead and Underground distribution systems, substation plant and ancillary equipment.

Salary—N.J.B. Class F, Grade 9, £675/£15/£720 per annum.

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Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Rd, Grimsby, not later than 7 Apr., 1955.

No. 5 (Wakefield) Sub-Area
Doncaster District
GENERAL ASSISTANT DISTRICT ENGINEER

Applicants must have had a sound practical training with experience in the construction, operation and maintenance of H.V. and M.V. overhead and underground distribution networks, substation plant and ancillary equipment.

Applicants must hold a current driving licence, be prepared to reside in the district and undertake standby duties.

Applicants must hold at least a Higher National Certificate in Electrical Engineering.

Salary—N.J.B. Class F, Grade 11, £595/£15/£640 per annum.

Wakefield District
JUNIOR ENGINEER (COMMERCIAL)

Applicants should have had a sound technical and practical training and be able to advise consumers on matters regarding the utilisation of electricity. They should be familiar with the Supply Regulations and have at least a Higher National Certificate in Electrical Engineering.

Salary—N.J.B. Class F, Grade 14, £475/£15/£520 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a Denby Dale Rd, Wakefield, not later than 7 Apr., 1955. (R 286)

BRITISH ELECTRICITY AUTHORITY
South Wales Division

Vacancy No. 31/55

APPLICATIONS invited for superannuable N.J.C. appointment of ASSISTANT in the Statistics Section of Generation (Operation) Department, Divisional Headquarters.

Salary: Grade 3—£585/£645 per annum.

To assist in the advanced analysis and presentation of technical statistics.

University degree (preferably in mathematics or economics (statistics)) or equivalent and/or experience in the Electricity Supply Industry.

Application forms obtainable from Secretary, South Wales Division, British Electricity Authority, Twyn-y-Fedwen Rd, Gabalfa, Cardiff, to be returned by 4 Apr., 1955. (R 318)

LONDON ELECTRICITY BOARD
ENGINEERING DRAUGHTSMEN

APPLICATIONS are invited for two positions as Engineering Draughtsmen in the Drawing Office of the Board's Western Sub-Area situated in Central London.

Candidates must have had a good general and technical education up to the National Certificate standard, and must be neat draughtsmen. They should be conversant with the layout of switchgear and transformers and associated equipment up to 11 kV for small substations. They should also be conversant with electrical diagrams, mains records, and similar work. Applicants with sound experience in surveying and planning of mains networks would be considered even if having little experience of substation layouts.

The post is graded under Schedule D of the National Joint Board agreement as Grade 6—£535 10s./£661. 10s. per annum, inclusive of London Allowance.

Application forms obtainable from Personnel Officer, 46/7 New Broad St, London, E.C.2, to be returned completed within 10 days from the date of publication of this advertisement. Please enclose addressed envelope and quote ref.: V/1930/T. (R 328)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:

Worcester and District Sub-Area

FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER (STRATFORD-ON-AVON DISTRICT)

Applicants should have had a sound technical training, and experience in industrial, commercial and domestic installations in rural and urban districts. Duties will include advice on utilisation, preparation of estimates, etc., supervision of contracting work, Service Centres and consumers' service. Technical qualifications desirable. Salary £715/£760 per annum (N.J.B. Grade D.6).

Apply in writing within seven days stating age, qualifications, present position and salary to Mr R. Mallet, Sub-Area Manager, Midlands Electricity Board, Whittington, Worcester.

Central Gloucestershire Sub-Area

DISTRICT SENIOR CLERK (STROUD DISTRICT)

Duties involve the control of consumers' records and associated matters, contracts, costing and invoicing, payment of wages, meter reading and general clerical and stores work of a District Office. Salary £645/£720 per annum (N.J.C. Grade 4).

Apply in writing within fourteen days stating age, experience and qualifications, present appointments and salary to Mr D. Holt, Sub-Area Manager, Midlands Electricity Board, 126 London Rd, Gloucester.

A. STEPHENS,
Secretary.
(R 320)

AIR MINISTRY Works Designs Branch requires in London and Provinces (with liability for overseas service) ELECTRICAL ENGINEERING DRAUGHTSMEN experienced in preparation of schemes for illumination and electrical equipment of buildings or in electrical distribution H.V. and M.V. Technical training to O.N.C. standard or equivalent an advantage. Salaries up to £810 per annum starting pay dependent on age, qualifications and experience. Overtime or extra duty allowance payable. Posts non-pensionable with long-term possibilities. Natural-born British subjects only. Write stating age, qualifications, employment details including type of work done to Ministry of Labour, 236 Walworth Rd, London, S.E.17, quoting Order 85/BD. (R 131)

AN ELECTRICAL DESIGNER for Rotating electrical machines is required by South Wales manufacturers. Applicants should possess a Degree or H.N.C. or equivalent, and have had considerable experience in rotating machine design.

The appointment is a senior one, and the successful applicant will be responsible to the Chief Engineer. The position carries an attractive salary, together with a non-contributory pension scheme. Apply—Box No. 4347, Electrical Times. (R 176)

APPLICATIONS are invited from those interested in a position as INDUSTRIAL HEATING ENGINEER and Agricultural Representative for The General Electric Co., Ltd., in London and the Provinces, to promote sales in space heating and other I.H. equipment also in agricultural electrical equipment. Candidates, not over 35 years of age, should have the H.N.C. in electrical engineering or the equivalent, and some previous experience in the selling of the foregoing equipment. A good personality and enthusiasm for sales work are essential. Apply in writing quoting reference I.H. to the Staff Manager, Magnet House, Kingsway, W.C.2. (R 192)

APPLICATIONS are invited for the post of CHIEF ELECTRICAL ENGINEER, Pakistan Railways. Salary Rs. 1,400 p.m. plus £30 p.m. Overseas Pay. 1 rupee = 2s. 2d. approx. Contract 3 years. Qualifications: Electrical Engineering Degree and considerable experience in railway administration, maintenance of Power House and train lighting. Further particulars and application forms from the Recruitment Officer, Education Division, Pakistan High Commission, 39 Lowndes Sq, S.W.1. (R 267)

ASSISTANT ENGINEER / SURVEYOR required in connection with overhead line work in East Scotland. Applicants should have experience in this type of work and preferably be under 40 years of age. Applications giving details of training, experience and age to Employment Manager, Messrs Johnson and Phillips Limited, Victoria Works, Charlton, S.E.7. (R 325)

BRUSH Electrical Engineering Company Ltd., Loughborough, has a vacancy for a HOME SALES MANAGER who will be responsible for all sales in the United Kingdom of a wide range of electrical products, including turbines, transformers, switchgear and rotating machines. This is a senior executive appointment and carries responsibility to the Sales Director. The position is permanent and progressive with a good salary and conditions of employment. Applicants, who should have relevant experience and the appropriate technical qualifications, should write, giving full details of education and experience, to the Personnel Director, The Brush Group Ltd., 32 Duke St, St. James's, London, S.W.1. (R 310)

CONTRACTS ENGINEER for London contractor, specialising in excavating, cable laying, jointing and overhead line construction. Duties to include estimating, preparation of technical specifications and supervision of contracts. Good technical background essential. Reply giving full particulars stating experience, salary required, and age.—Box No. 4381, Electrical Times. (R 313)

CONTRACTS ENGINEERS required for extensive underground cable installation work in North Midlands area. Age limits: 25-35. Experience and salary required, to—Box No. 4385, Electrical Times. (R 315)

DESIGNERS required by leading manufacturers of electric wiring accessories.

1. For product design. Must have had previous specialised experience with plugs and sockets, switches, etc., designed for large scale production.

2. For jig and tool design. Must have had previous experience in the design of press tools and jigs for the mass production of small and intricate mechanisms. Good salaries are offered and these positions are permanent and have excellent prospects. Superannuation scheme in operation, 5-day week, etc. Apply in confidence, giving details of experience, age and salary required to General Works Manager, M.K. Electric Ltd., Wakefield St, London, N.18. (R 323)

DESIGN ENGINEERS and DRAUGHTSMEN with experience E.H.T. Outdoor Airbreak Switchgear also Metal-clad Switchgear up to 11 kV required by design and manufacturing firm in South Midlands. Good salary. Progressive position for successful applicants. Housing accommodation rental or purchase. Reply to—Box No. 4373, Electrical Times. (R 268)

DESIGN DRAUGHTSMAN with some electrical knowledge for plant, process, jig, tool and product design in modern progressive factory. Scope for young man with initiative. Apply in writing, giving full details of experience and salary required, to: Backer Electric Co., Limited, Fitzwilliam Rd, Rotherham. (R 266)

ENGINEERS required for expanding department concerned with Traction Control Gear. The work consists of tendering, apparatus design, preparation of diagrams, lay-out of equipment and testing of control equipments for all types of electric and diesel electric rolling stock and locomotives, mining and industrial locomotives, and road transport vehicles. Applicants must have a Degree or H.N.C. in electrical engineering. They must have completed or be exempt from National Service. The posts are permanent and pensionable. Write for application form to: The Personnel Manager, Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester 17, marking envelope "O.1." (R 201)

ELECTRICIANS & ELECTRICAL FITTERS

are required by

BOWATER'S LLOYD PULP AND PAPER MILLS LIMITED

in their Maintenance Dept., Kemsley Mill

Applications by letter to:

Resident Engineer, Kemsley Mill,
Bowater's Lloyd Pulp and Paper Mills Limited
Sittingbourne, Kent

Stating:

1. Age
2. Particulars of Apprenticeship served
3. Experience.

Day Rate 3s. 11½d. Canteen Facilities
Contributory Pension Scheme
(R 194p)

ELECTRICAL Wholesaler (London) requires experienced TRADE COUNTER ASSISTANTS. Write giving full details, age, experience and salary required to—Box No. 4365, Electrical Times. (R 223)

ELECTRICAL DRAUGHTSMAN wanted for both diagram and layout work. Minimum qualifications, Ordinary National Certificate. Minimum age, 23. Salary according to age and experience. Canteen facilities. Contributory Pension Scheme. Write in confidence to: Resident Engineer, Bowater's Lloyd Pulp and Paper Mills Limited, Kemsley Mill, Sittingbourne, Kent, marking envelope "Private and Confidential." (R 193)

ELECTRICAL MAINTENANCE ENGINEER required for D.C. power plant and A.C. lighting. Write stating experience and qualifications, wage required and whether married or single, to The Press at Coombelands Limited, Addlestone, Surrey. (R 282)

ELECTRIC LAMP MANUFACTURERS (ELMA) require live SALES AGENTS for the following areas: (*a*) Gloucestershire and Wiltshire; (*b*) North Wales and Anglesey; (*c*) Northern Ireland; (*d*) Kent and Sussex. Applicants should be well connected with Electricity Boards, Industrial Users and Wholesalers. Apply with details of agencies held, etc., to—Box No. 4335, Electrical Times. (R 145)

ELECTRICAL DRAUGHTSMEN required with experience in detailing and taking off materials with minimum supervision for electrical installations for Houses, Flats, Schools, Industrial Plants, etc. Progressive appointments. Applications giving details of age, experience and training to George Wimpey and Co., Limited (Dept. 5, Electrical), 27 Hammersmith Grove, London, W.6. (R 327)

ELECTRICAL DEVELOPMENT ENGINEER required by leading suppliers of electric welding equipment. Men of Higher National Certificate standard who have served apprenticeship and with some experience of welding requirements preferred. Interesting work and good prospects. Pension Fund. Please apply at once to Dept. W.E.D., The Quasi-Arc Company Limited, Bilston, Staffs, giving full particulars of age, qualifications and experience. (R 307)

TRANSFORMER ENGINEERS

Vacancies for men with a Degree or H.N.C. for design of large high voltage and medium power transformers. The department is expanding rapidly, and the work is interesting and varied. The posts are permanent and pensionable. Applicants must have completed or be exempt from National Service. Write for application form to:

The Personnel Manager,
Metropolitan-Vickers Electrical Co., Ltd.,
Trafford Park, Manchester, 17,
Marking envelope "P.1."
(R 153p)

One or two

RESEARCH ENGINEERS

are required by

THE ENGLISH ELECTRIC COMPANY LTD.,

at their

GUIDED WEAPONS DIVISION

at LUTON,

for extended studies into miniature high speed turbines and pumps, hydraulic servo systems and their associated control valves.

The suitable men should be well qualified in mechanical engineering but an ability for original thought, and to work without supervision is of paramount importance.

Salaries will be generous to the right applicants and housing assistance is possible. These posts offer excellent prospects for original work for which every facility will be offered.

Applications to Dept. C.P.S., 336/7, Strand, W.C.2.,

quoting Ref. 1181D.

(R 243p)

ELECTRICAL Research Association. TECHNICAL ASSISTANT required for Research on Applications of Electricity in Agriculture. Qualifications expected are a good degree in Electrical or Mechanical Engineering with some knowledge of Machine Design. Experience or interest in Agriculture would be an advantage. Starting salary will be in the range of £500/£600 per annum, with superannuation provisions. Applications should be addressed to the Director, E.R.A. Field Station, Shinfield Green, nr. Reading, to arrive not later than 4 Apr., 1955. (R 304)

ELECTRICIAN wanted by small factory in Birmingham Area, to take sole charge of maintenance of approx. 150 motors, 1/20 h.p.—30 h.p., Switchgear and Lighting installation.—Box No. 4379, Electrical Times. (R 312)

ENGINEER with electrical or physicist degree required for development work on testing equipment for telecommunication cables. Permanent and pensionable position at salary commensurate with experience and qualifications. Please apply giving full particulars to Personnel Officer, Southern United Telephone Cables Ltd., Dagenham Dock, Essex. (R 324)

SHIFT CHARGE ENGINEER

required by The Steel Company of Wales Limited (Steel Division), Abbey Works, Port Talbot, in their Electrical Distribution Department.

The successful candidate will be responsible for the control, operation and maintenance of electricity supply, generation (output) and distribution systems connected with a large integrated iron and steel plant.

Sound technical knowledge and previous experience with heavy industrial plant essential.

Higher National Certificate or equivalent desirable.

The position is permanent and pensionable.

Those wishing to apply should write for official Application Form to the:

Personnel Superintendent,
The Steel Company of Wales, Ltd. (Steel Division)
Abbey Works,
PORT TALBOT, GLAM.

(R 248p)

JOINTER (Extra High Tension) required by London Electricity Board in O. and M. Branch of the Hackney/Stoke Newington District, Northern Sub-Area. N.J.I.C. rates and conditions—4s. 5d. per hour. Application forms from Personnel Officer, 46/7 New Broad St, London, E.C.2. Please enclose addressed envelope and quote ref.: M/3380/T. (R 264)

JUNIOR ENGINEERS required for contract dept., of company dealing with power station cabling contracts, O.N.C. or equivalent. D/O experience an advantage. —Box No. 4375, Electrical Times. (R 269)

JUNIOR RESEARCH ENGINEER. The Lamp and Lighting Division of the Research Laboratory has a vacancy for a young man with a degree, H.N.C., or equivalent qualifications in electrical engineering or physics, for investigations into the performance of discharge lamp circuits and field operational problems. Please write, giving full particulars, to the Director of Research, The British Thomson-Houston Co., Ltd., Rugby, quoting reference MVR. (R 37)

MAINS FOREMAN for Suez Canal area to supervise minor construction work and day-to-day maintenance of overhead and underground mains, 11 kV and 440 V, with associated small substations and pole transformers on small Public Utility system. Preference given to applicants having similar experience with Supply Companies at home or abroad. 2-year tour in first instance. Generous salary and leave conditions. Free furnished accommodation. Selected applicants required to proceed overseas unaccompanied by families, only single quarters being available for first few months. Write Box E.T. 186, c/o 191 Gresham House, E.C.2. (R 326)

METER TESTER for Class A Station in Galashiels. Applicants should have experience of testing and calibrating all types of single and polyphase meters. N.J.I.C. conditions. Rate 49d. per hour. Applications stating age, experience and present employment within 14 days to Manager, South East Scotland Electricity Board, Southern Sub-Area, High St, Galashiels. (R 308)

MONSANTO CHEMICALS LIMITED require an ELECTRICAL DRAUGHTSMAN with experience in the design of installations of electrical equipment in chemical and associated plants, including H.T. and L.T. distribution, lighting and power layouts. Minimum qualification—O.N.C. The post is permanent and pensionable and a good salary will be paid. Five-day week, lunch voucher scheme, are in operation. Apply in writing giving full details of age, training and experience to the Chief Personnel Officer, Monsanto Chemicals Limited, 8 Waterloo Place, London, S.W.1. (R 309)

OVERHEAD LINE ENGINEERS. Immediate vacancy for Senior and Junior Contracts Engineers for overhead line construction work. Age limits: 25-40. Experience and salary required, to—Box No. 4383, Electrical Times. (R 314)

PILKINGTON BROTHERS LIMITED, Plate Glass Manufacturers, Doncaster, wish to appoint to their Staff an INSTRUMENT TECHNICIAN, 25 to 40 years of age, having some years' experience in the installation, maintenance and calibration of all classes of process instruments and automatic controls. He should possess the H.N.C. in Electrical Engineering or its equivalent, and be prepared to assist in the Development of New Instruments to meet the requirements of the process. Apply to the Works Personnel Officer. (R 287)

REPRESENTATIVES required for London and some provincial areas. Lamp sales experience an advantage, good conditions, pension scheme, etc. Apply with full details in confidence to General Manager, Stella Lamp Co., Ltd., 37 Oxford St, W.1. (R 140)

THE CAROLINE HASLETT TRUST

The Trust invite applications for the award of a Travelling Exhibition, which will entitle the holder to study, for a period of one to three months, some aspect of domestic electrification in another country. The place selected for this year's exhibition will be the LOW COUNTRIES, unless the special interests of the successful candidate justify another choice.

In view of the restrictions on sterling exports the exhibition will be limited to cover moderate expenditure on travelling and maintenance.

Applicants MUST hold the DIPLOMA in Electrical Housecraft awarded by The Electrical Association for Women.

Completed applications should be received by 30 Apr., 1955.

Application Forms may be obtained from:

The Caroline Haslett Trust,
45 Eastcastle St,
London, W.1.

(R 265p)

REPRESENTATIVE, resident in London Area required for TEMCO Electrical Accessories. Salary, commission, expenses and car provided. Pension Scheme in operation. Written applications, which should state remuneration required, to Mr S. M. Harris, T.M.C.-Harwell (Sales) Ltd., 37 Upper Berkeley St, London, W.1. (R 154)

SWITCHGEAR SALES ENGINEER required by old established company in Manchester manufacturing heavy electrical switchgear. Excellent prospects and liberal salary offered as the Company is expanding. Preference given to candidates holding B.SC., A.I.M.E.E., or H.N.C. Own staff notified of this vacancy.—Box No. 4363, Electrical Times. (R 211)

THE ENGLISH ELECTRIC COMPANY, LTD.

at Stafford

invite applications for positions as SALES OR CONTRACTS ENGINEERS in their Rectifier Department.

Applicants should have completed National Service and served an apprenticeship in the electrical manufacturing industry. The minimum technical qualification acceptable is H.N.C. in Electrical Engineering. Some experience with Mercury Arc Rectifiers would be an advantage, but is not essential.

The work is interesting and varied, dealing with the application of Rectifiers in many industries and to railway electrification.

The positions carry good salaries, are permanent, progressive and, following a probationary period, come within the scope of the Company's pension scheme.

Reply with full personal particulars, to Dept. C.P.S., 336/7 Strand, W.C.2, quoting Ref. 1230A. (R 306p)

THE ENGLISH ELECTRIC COMPANY LIMITED
at Stafford

have the following vacancies in their Meter and Relay Department.

SENIOR RELAY ENGINEER having wide experience of protective relays, for important work in a rapidly expanding section. University degree or H.N.C. standard is essential for this position.

RELAY SALES AND CONTRACTS ENGINEER. Young men interested in this field of electrical engineering preferably with some previous experience, although this is not essential since training will be offered to otherwise suitable candidates. Minimum technical qualifications of O.N.C.

METER ENGINEER. Young men, preferably having either manufacturing or testing experience are required for the Development Laboratory and Design Section of this Department. Technical qualifications preferably H.N.C. although consideration would be given to a young engineer with wide practical experience and of O.N.C. standard.

All the posts offered are permanent, progressive and pensionable.

Applications should be sent to Dept. C.P.S., 336/7 Strand, W.C.2,

quoting Ref. 1366A.

(R 283p)

SALES ENGINEER required with knowledge of rubber cables for the north-east England area. Outside sales experience essential. Apply in writing, giving age, full details of training and experience to the Employment Manager, Johnson and Phillips Ltd., Victoria Way, Charlton, London, S.E.7. (R 263)

THE STEEL COMPANY OF WALES LIMITED
(Steel Division)
PORT TALBOT
INVITE

applications from suitably qualified men for the following vacancies in their Power Plant Department.

(*a*) ONE DEVELOPMENT ENGINEER.

(*b*) TWO ASSISTANT DEVELOPMENT ENGINEERS.

Applicants should have extensive experience in the technical operation and maintenance sections of all types of boiler and turbine plants.

Some knowledge of the preparation of statistics, project schemes, plant specifications, etc., would be an advantage.

Candidates should be able to produce evidence of advanced technical education in electrical and mechanical engineering.

The positions are permanent and pensionable.

Those wishing to apply should write for official Application Form to the:

Personnel Superintendent,
The Steel Company of Wales Limited,
(Steel Division), Abbey Works.
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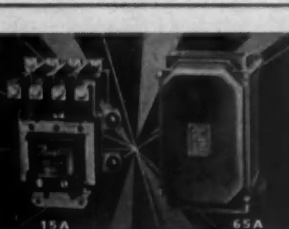

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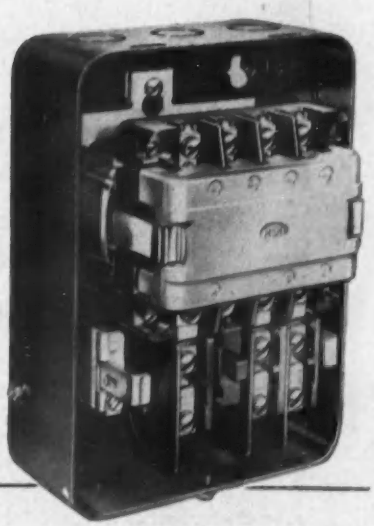

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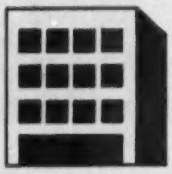

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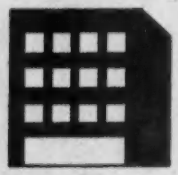

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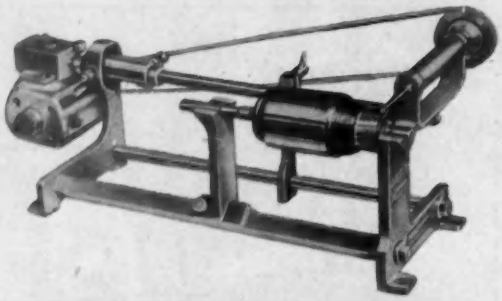

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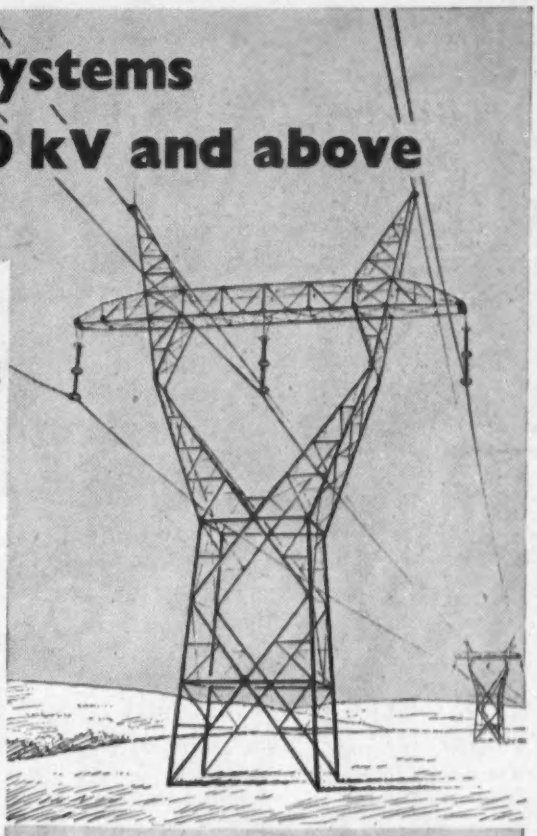

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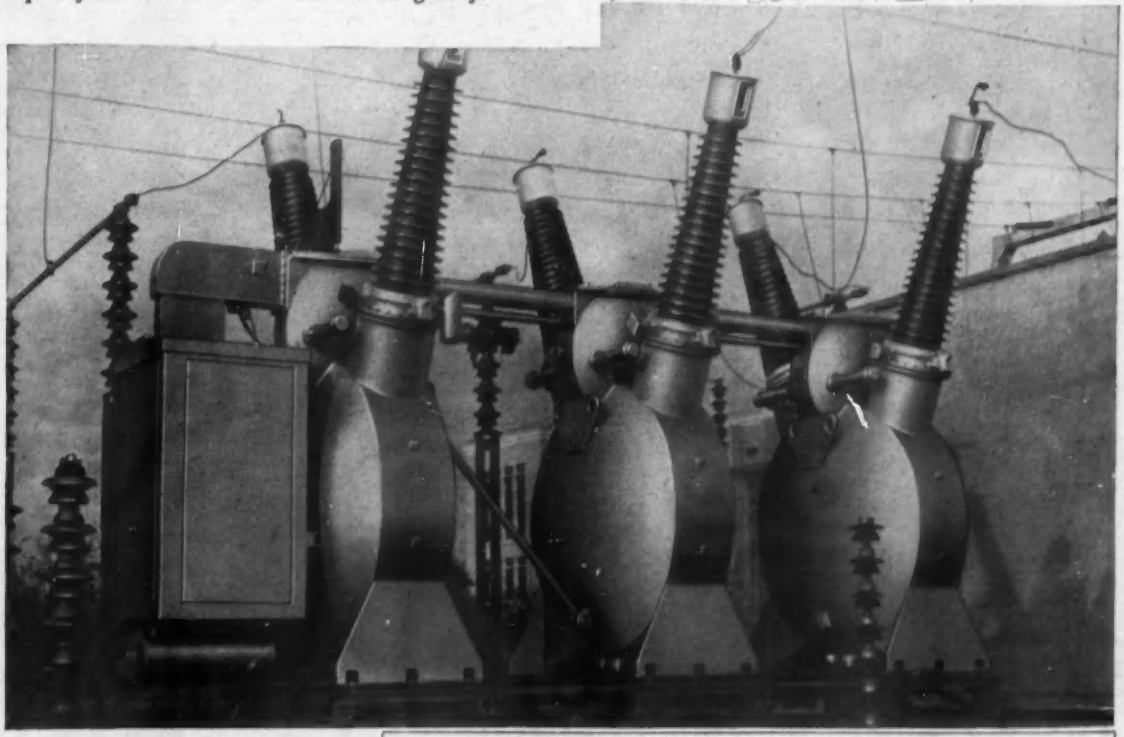

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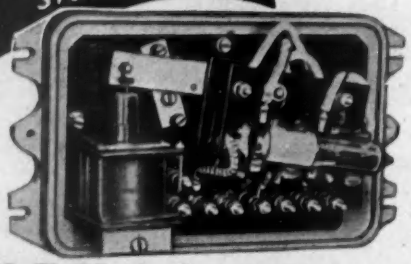

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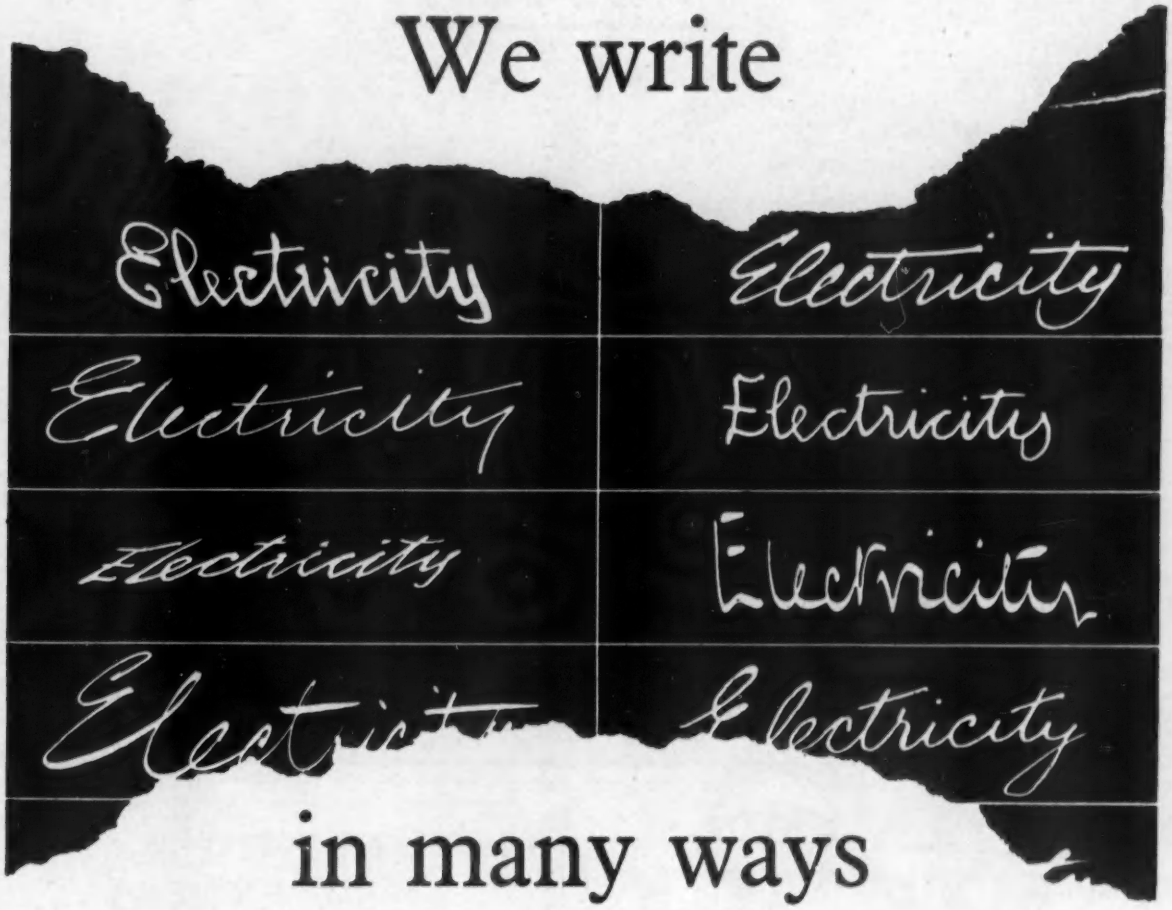

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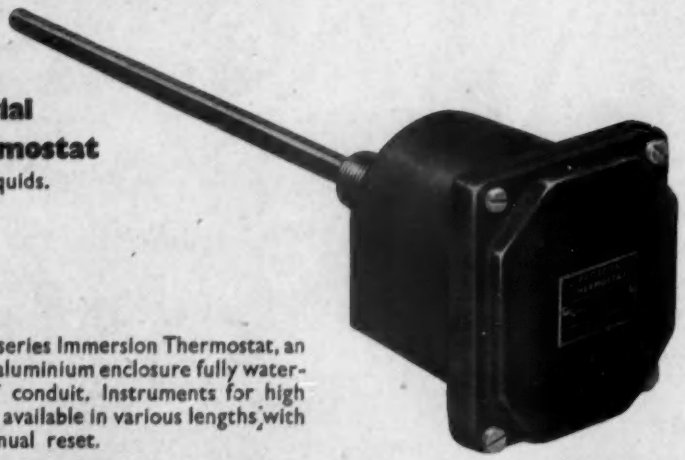

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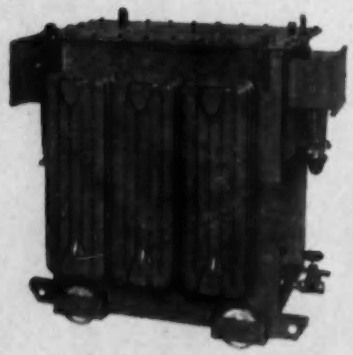

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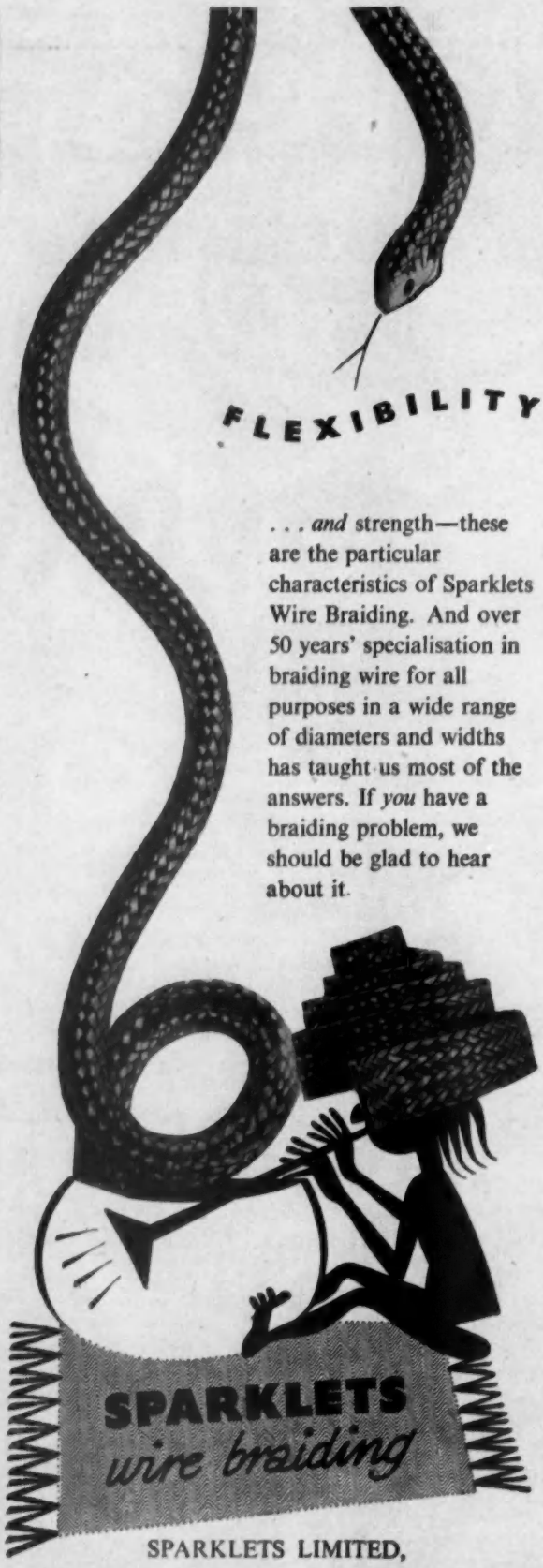

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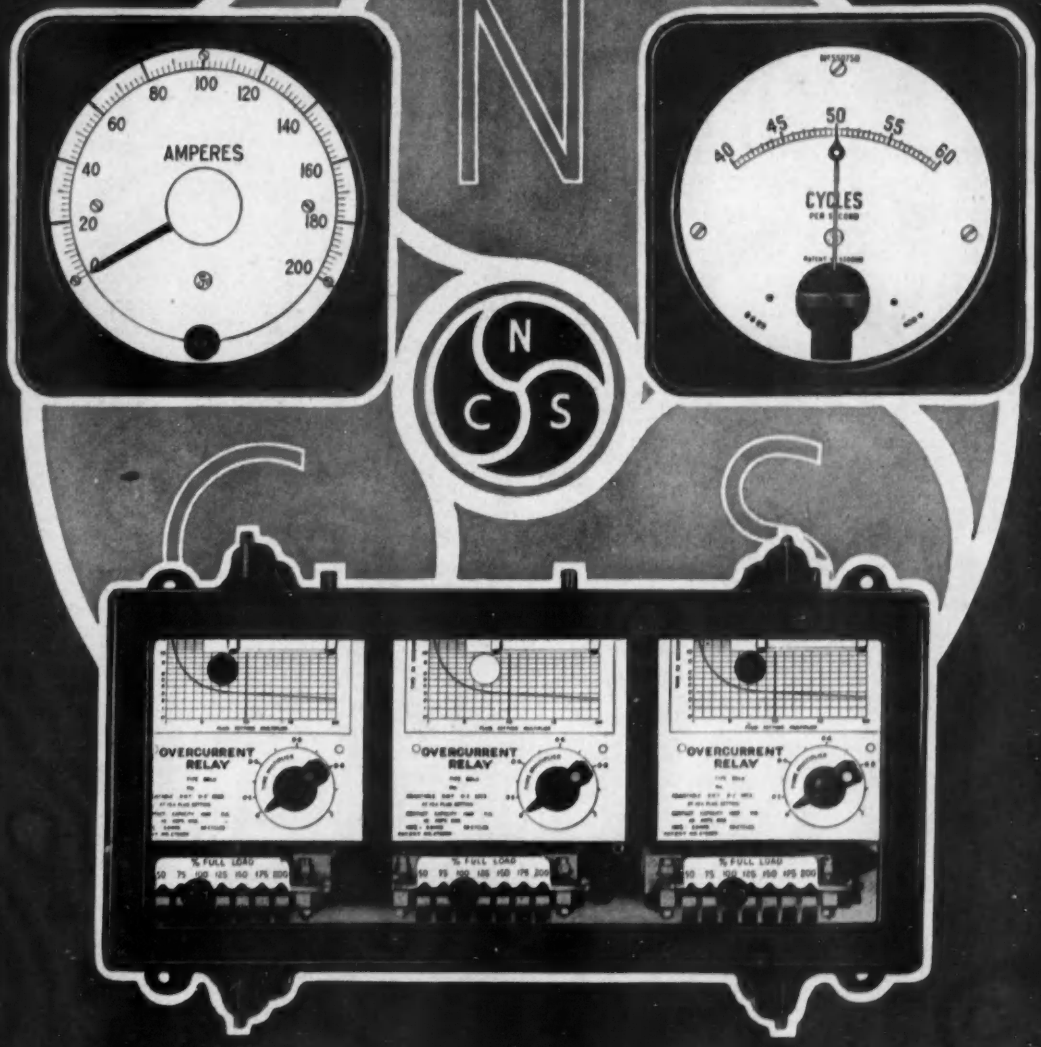

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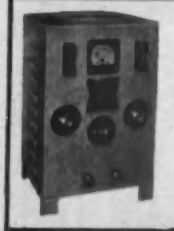

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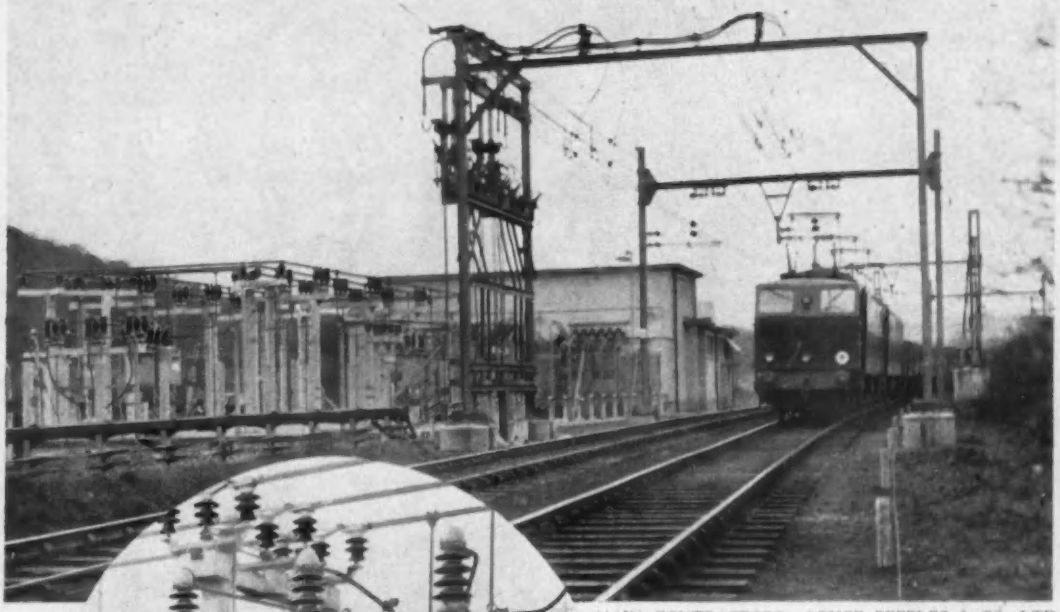

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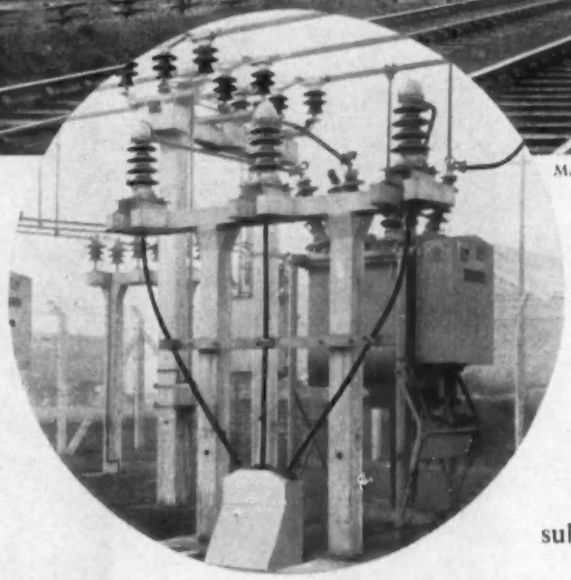

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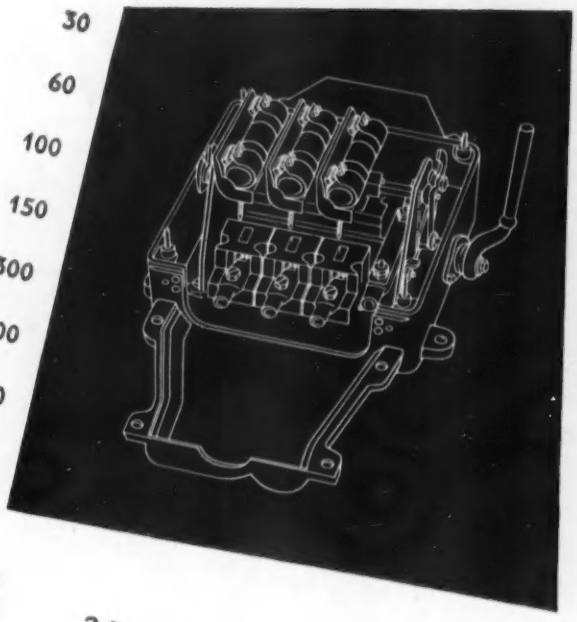

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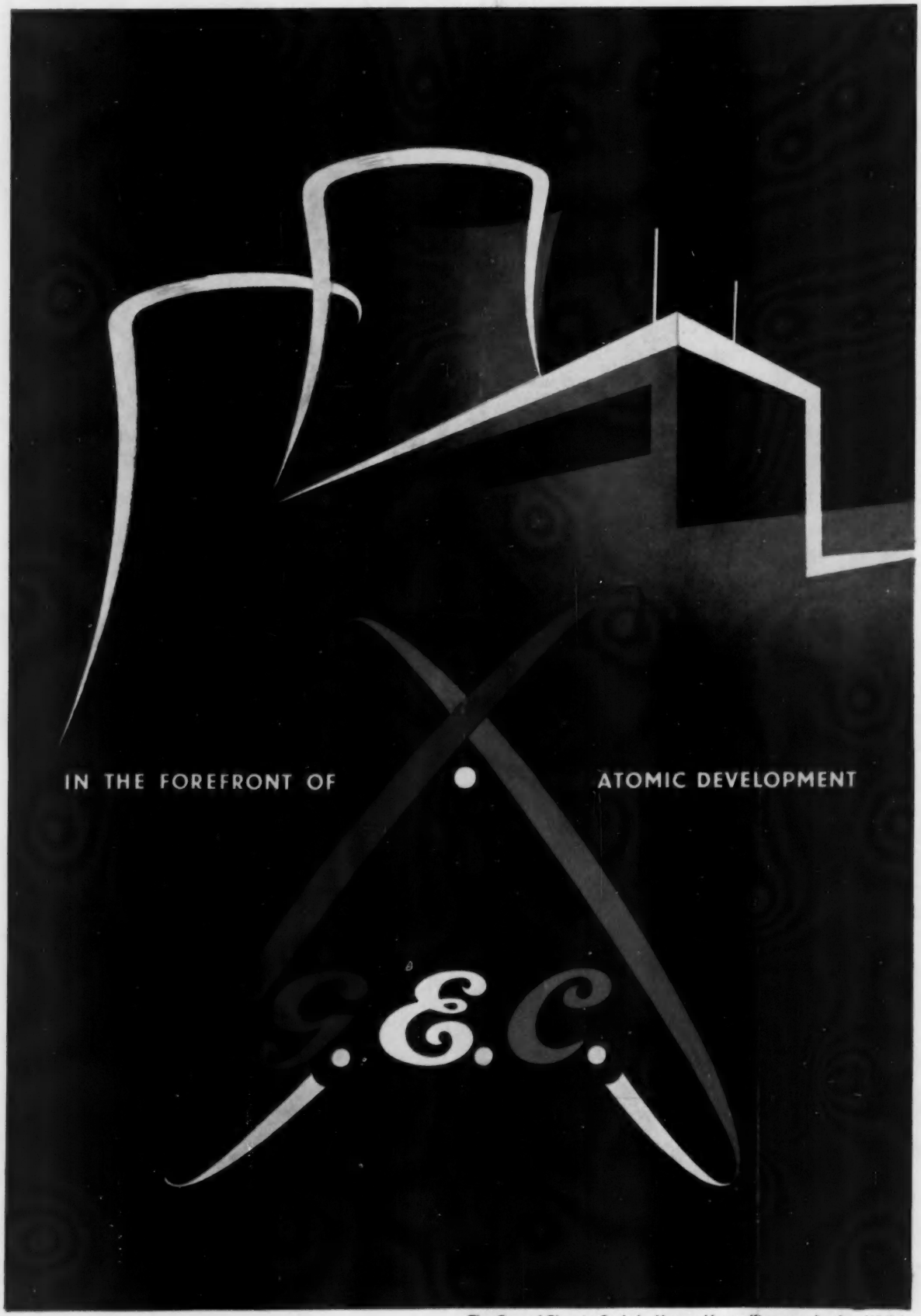

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